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MEN'S FABRIC PREFERENCES RELATED TO AGE, INHERENT COLOUR VISION, AND MODE OF PERCEPTUAL DISEMBEDDING

BY

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A THESIS

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled Men's Fabric Preferences Related to Age, Inherent Colour Vision and Mode of Perceptual Disembedding submitted by Lorna E. Blackwell in partial fulfilment of the requirements for the degree of Master of Science in Clothing and Textiles.

ABSTRACT

Men's Fabric Preferences
Related to Age, Inherent Colour Vision and
Mode of Perceptual Disembedding

by

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University of Alberta, 1979

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The primary purpose of the research was to investigate the relationships between men's fabric preferences and their age, their inherent colour vision, and their perceptual disembedding ability. Innate characteristics as opposed to social factors were explored as possible motivational forces governing selection of certain textiles for clothing. The theoretical framework was based on the statistical evidence of Kalmus (1960) that 11.2% of all Canadian men are colour blind; the work of Judd (1963) who stated that colour blind men are handicapped in the modern world; Combs (1959) that the perceptions of the physically abnormal (deaf,blind) differ from those of the normal; the theory of Witkin (1947) that people are relatively Field Dependent or Field Independent in perceptual disembedding tasks; and the postulations of Birren (1961) and Pickford (1965) that colour blind men are debilitated or facilitated respectively in their mode of per-

ceptual disembedding.

A non-random sample of 27 colour normal men and a second sample of 27 colour blind men were selected ranging in ages from 18 to 52. The instruments administered were: Background Information, Ishihara Pseudoisochromatic Plates, Measure of Fabric Preferences, and Witkin's Embedded Figures Test (Short Form).

The Pearson Product Moment Correlation, Spearman- Brown formula, and analysis of variance were used to analyse the data. Results of the descriptive and statistical analyses were as follows:

1. Validity and reliability were established on the Measure of Fabric Preferences.
2. Men's fabric preferences in rank order from least to most preferred were: pattern, large design, tint, textured, small design, shade, smooth, and plain.
3. Tint was the only fabric variable which was significant at the 0.05 level in relationship to age.
4. No significant differences were found between colour normal and colour blind men in fabric preferences.
5. No significant correlations were established between perceptual disembedding ability (Field Dependence) and fabric preferences.
6. No significant correlation was found between age and perceptual disembedding ability.
7. A statistically significant difference was found between the perceptual disembedding ability of colour normal and

colour blind men. Colour blind men in the sample were more Field Independent than colour normal men.

The findings only partially supported the theoretical framework. Colour blind men in the present research were not found to be handicapped in our society, specifically in the area of fabric selection. On the basis of the study, it would seem that social as opposed to inherent factors help to determine men's fabric preferences.

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The author is indebted to all of the men who volunteered to participate as subjects in the study. Finally, deep appreciation is extended to Mr. John Blackwell, mentor, who has assisted in countless ways.

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CHAPTER I

INTRODUCTION

Statement of the Problem

Fabric preferences among men would seem at first consideration to be individualistic in nature, stemming from such factors as past experience, socio-economic status, preferences of others who are close to the invididual, or the ever-changing whims of fashion. Age groups tend to distinguish themselves by clothing types, which implies that there are varying forces behind the fabric selections of different generations of men. Certain innate variables also, may predispose men to select particular colours, designs or textures. Two such variables are colour blindness and mode of perception. If these are influential factors, then groups who share common preferences could be isolated and identified. One purpose for this type of classification would be the utilization of the information by manufacturers of menswear. By understanding the motivational aspects behind clothing selection, manufacturers are more apt to produce fabrics which have optimum satisfaction for their male customers, and therefore are more marketable. The study serves also to provide information about colour blindness and its effects upon everyday choices of men. Since little previous research has been located on men's fabric preferences, the present study is an exploratory one and poses the question, "What is the relationship between men's fabric preferences and their ages, their

inherent colour vision, and their mode of perceptual disembedding?"

Justification

The majority of research which has been done in the field of clothing and textiles has neglected men. The Compton Fabric Preference Test Was designed for and administered exclusively to women. During the last two decades the wealth of colours, patterns, and textures in men's clothing has been unrivaled since the very ornate Rococo period which occurred immediately prior to the French Revolution. Up until the 60's in the twentieth century, men's clothing fabrics were limited to the conservative taste. The male population seems to be responding to this recent upheaval in fashion with an augmented awareness of, and interest in, clothing and textiles. Promotion campaigns should be aimed at men rather than women who traditionally shopped for men. It was found that it was primarily underwear and not suits or sportswear that women most frequently purchase for men. Their opinions, however, are still requested by many men before making a purchase. (Retailing Today--No More Season, 1970, p. 170). This practice may decline as women increasingly choose full time occupations outside of the home and thus have less time to shop for men. In order for men's advertising to be effective the rationale behind their decisions must be examined. A study of men's preferences could be invaluable in this area.

Fabrics selected by an older man are frequently very distinct from those selected by a younger man. This can be

attributed, perhaps, to the wider range of past experiences of the older man as opposed to the limited exposure to fashion of the youth. Causation may also stem from the sensory deprivation of the older man beginning with the sense of hearing at age 40, followed by vision at 50, touch at 55, taste from 55 to 59, and smell after 70 (Pastalan, 1975, p. 1). Compensation with increased visual and tactile characteristics in fabrics for clothing may result. Considering the needs and preferences of an older population, especially those in their near environment, so that their psychological well being and quality of life are enhanced, is very important.

People with normal colour vision generally fail to take into account the existence of colour blindness. In Canada, the defect occurs in such formidable numbers that it can not be ignored. In all of the nations tested for red-green colour defectiveness, Caucasian, Canadian males ranked among the highest in frequency at 11.2% (Pickford, 1963). In addition since colour blind men adapt extremely well to their affliction and no longer are subject to natural selection, there is a tendency for this incurable and hereditary defect to increase. Information is required concerning the seriousness of colour blindness in our world today as well as in the future. A comparative study of the choices made by colour normal and colour blind men could point out some of the differences or similarities between the two groups.

In studies done involving the outer space environment, where artificial light is the norm to alleviate the tedious blackness, colour was found to have immense phychological value. "Colour planned as an intrinsic portion of the artificial environment can help to keep the senses occupied and stimulate the nervous system to overcome possible sensory deprivation" (The Fascinating World of Colour, p. 10). In the case of fabrics, colour blind men may substitute textural or design interest to avoid sensory deprivation caused by their limited range of discernible colour. A study which involved both colour normal as well as colour blind men, therefore, may well show distinct and measurable differences. In the words of Lee (1938) "A colour blind person or a tone deaf person cannot discriminate as much as a person with normal sight or hearing, and he cannot prefer what he cannot experience" (p. 128). Judd (1963) regards colour blind men as a potential market segment because they have special needs and collectively constitute a distinct consumer group not yet successfully tapped.

Perception, another inherent factor being considered in this research, has been shown to be consistent for an individual throughout a variety of perceptual tests indicating that the mode of perception is constant for any one individual. This mode may permeate all aspects of our existence including that of fabric selection. Birren (1961)

theorizes that the colour sense aids perception. This implies that a colour defective person may have a mode of perception which is distinct from that of a colour normal person. The implication justifies an investigation of the relationship between colour vision and disembedding ability.

Clothing and its materials play a major role in establishing first impressions upon others. The manner in which one is attired is, in some instances, important to both personal and social success. It seems essential, therefore, to seek motives for choices made in clothing and textiles. Thus, suitable changes may be made to enable more favorable first impressions and successful dressing to occur.

Objectives

The primary objectives of this study were to:

1. Develop, pretest, and establish the validity and reliability on the Measure of Fabric Preferences for men.

2. Investigate the relationship between age and men's fabric preferences.

3. Investigate the relationship between colour vision ability and men's fabric preferences.

4. Investigate the relationship between perceptual disembedding ability and men's fabric preferences.

The secondary objectives of this study were to:

5. Investigate the relationship between age and per-

ceptual disembedding ability.

6. Investigate the relationship between colour vision ability and perceptual disembedding ability.

Hypotheses

The hypotheses will all be stated in the null form. The following hypotheses have been formulated to be tested using a scattergram and the Pearson Product Moment Correlation statistical test.

1. There will be no significant correlations between perceptual disembedding ability and a preference for:
   a. patterned fabric
   b. plain fabric
   c. large design on fabric
   d. small design on fabric
   e. tint fabric
   f. shade fabric
   g. textured fabric
   h. smooth fabric
2. There will be no significant correlation between age and perceptual disembedding ability.

The following hypotheses were formulated to be tested using an analysis of variance statistical test.

3. There will be no significant differences among age groups in their preferences for:
   a. patterned fabric

b. plain fabric

c. large design on fabric

d. small design on fabric

e. tint fabric

f. shade fabric

h. textured fabric

i. smooth fabric

4. There will be no significant differences between colour normal men and colour blind men in their preference for:

a. patterned fabric

b. plain fabric

c. large design on fabric

d. small design on fabric

e. tint fabric

f. shade fabric

g. textured fabric

h. smooth fabric

5. There will be no significant difference between colour normal men and colour blind men in perceptual dissembedding ability.

Assumptions

The assumptions of this investigation were as follows:

1. Individuals were able to state a degree of fabric preference in a paired, forced-choice situation.
2. Fabric preferences were measurable on an interval scale.

3. Fabric preferences differed among males.
4. The Ishihara Pseudoisochromatic Plates accurately culled the colour blind men from the colour normal men.
5. All subjects answered the background information and the three tests with the same degree of conscientiousness.

Limitations

The limitations of this investigation were as follows:

1. All possible fabric types were not represented in the Measure of Fabric Preferences. Samples were limited by the availability of suitable types on the local market. Preferences might have varied if the test was expanded.
2. The samples of colour blind and colour normal men were not selected in a random manner. Extrapolations beyond this population , therefore, can not be made.
3. The Pseudoisochromatic Plates identify only the most common colour defect known as red-green colour blindness. More rare forms of the defect are not detected.
4. All subjects were not tested on the same day nor were they tested at the same time each day. Test locations, lighting, and distraction levels varied which may have caused variations in the responses.
5. The reliability on the Measure of Fabric Preferences ranged from r = 0.59 for large design on fabrics to r = 0.83 for shade fabrics on the test and from

r = 0.45 for textured fabrics to r = 0.81 for shade fabrics on the pre-test.

Definition of Terms

Achromatic. This is the refraction of white light without breaking it up into its component colours. It includes black and white and the entire series of intermediate greys. It is without colour (Funk & Wagnalls, 1968, pp. 12,267).

Anomalous. Abnormal (Funk & Wagnalls, 1968, p. 60).

Colour. Is the attribute of visual experience that can be described as having quantitatively specifiable dimensions of hue, saturation, and brightness (Bartleson, Burnham & Hanes, 1963, p. 15).

Any particular colour is an attribute of a particular species of light which is characterized by its wavelength of radiant energy (Kalmus, 1965, p. 3).

A colour is capable of stimulating the retina and its associated neural structures (Funk & Wagnalls, 1968, p. 267).

Colour stimulus. Is a coloured light or an object which reflects that light.

Defective colour vision (or colour blind). Often called colour blindness and refers to a variety of abnormal physiological conditions, usually congenital, which produce deviant colour responses or fewer colour responses than normal (Bartleson et al., 1963, p. 93). It is operationally

defined as one who is able to correctly read 13 or less of the 21 plates which make up the Ishihara colour test.

Design. Any pattern printed on or woven into fabric which distinguishes it from a plain fabric, for example stripe, check, plaid, herringbone, paisley, floral, geometric, realistic or abstract figures.

Dichromatism. Is the abnormal colour vision system in which the afflicted individual is capable of making two kinds of colour distinctions those being light and dark and either yellow-blue or red-green (Bartleson et al., 1963, p. 94).

Field Dependence or Independence. Pertains to the perceptual style characterizing a person who is either relatively reliant or unreliant upon the background when identifying a simple embedded figure. There are no absolutes but rather there are degrees of Field Dependence. Operationally defined it is the mean score in seconds on 12 trials of the Embedded-Figures Test.

Hue. The attribute of colour perception by means of which an object is judged to be red, yellow, green, blue, purple or intermediate between some adjacent pair of these (Huey, 1972, p. 75).

Light. Is the aspect of radiant energy of which a human observer is aware through the visual sensations which arise from the stimulation of the retina of the eye (The Science of Colour, 1953, p. 220).

Lightness. The attribute of colour perception by means of which an object is judged to reflect more or less light than another object (Huey, 1972, p. 25).

Monochromatism. Is the abnormal colour vision system in which the afflicted individual is capable of making one kind of colour distinction that being black-white or one of the spectral hues.

Plain fabric. A cloth of plain weave which is devoid of any design.

Preference. Liking of one thing more than another. Operationally defined a preference is a high score on one of the variables on the Measure of Fabric Preferences which was developed for this study.

Pseudoisochromatic. Apparently of the same colour (The Oxford English Dictionary Vol. V, p. 506 & Vol. VIII, p. 1542-1543).

Response. Is the generic name for all behaviour of the individual that results when some sense organ is stimulated (Bartleson et al., 1963, p. 48).

Retina. Contains the light sensitive elements of the eye called rod and cone receptors as well as nerves which are important for initiating conscious colour responses (Bartleson et al., 1963, p. 42).

Saturation. The attribute of colour perception that expresses the degree of departure from the grey of the same lightness (Huey, 1972, p. 25).

Stimulus. Any change in external or internal energy that gives rise to excitation of the nervous system sufficient to arouse a response in the person concerned (Bartleson et al., 1963, p. 17).

Texture. Refers to the surface quality of materials, how they reflect the light that hits them. It is the quality of the surface - hard, soft, rough, smooth, course, fine (Faulkner, 1972).

Trichromatism (or colour normal). Is the condition of normal human colour vision. It is operationally defined as being able to correctly read 17 or more of the 21 plates on the Ishihara colour test.

Visual receptors. Are the parts of the eyes that are stimulated when light passes into the eye; they are contained in the eyeball (Bartleson et al., 1963, p. 40).

CHAPTER II

REVIEW OF LITERATURE

This chapter is organized under the following headings; fabric preferences; the significance of colour and colour vision; the nature ofcolour; theories of colour vision; colour blindness; frequency of colour blindness; anthropological approach to colour blindness; and Field Dependence and perceptual disembedding.

Fabric Preferences

Fabric preferences of men has only briefly been examined through research. Compton (1962) devised a test exclusively for women to relate fabric preferences to personality variables. Lathrop (1968) investigated the pyschological effects of textile textures and found that Barrier was independent of textural preferences for a group of 24 men. Harrison (1968) examined factors which men deemed most important when selecting clothing. The rank order of the factors in her research from most to least important were: fit, colour, price, style, and quality. Friberg (1974), in a similar study, found that fit was the most important factor followed by style, colour, fabric, and price. Adams (1971) found that the priority for men when choosing suits was colour and then construction. Dallal (1971) included age as a variable and found that it had no effect on men's colour choices in fabric. Men in the study were first assessed for colour vision ability using the Ishihara Pseudoisochromatic Plates and were eliminated from

the study if found to be colour defective. No frequency rates were reported on the number of men excluded because of colour blindness.

Significance of Colour and Colour Vision

Colour is an integral part of human life. Normal colour experience contributes immeasurably to our ideas of beauty and to our aesthetic appreciation of objects in our everyday world (Chapman, 1965). In the theatre, colour plays a major role in complementing each scene and creating visual impressions (Ross, 1938). Our history is rich with descriptive colour. We make reference to "bolts from the blue," "once in a blue moon," having a "green thumb," or being "in the pink" (Egan, 1973). Judd (1963) views this need for coloured sight in a much more pragmatic sense. He says that the farmer must judge the value of the land by the colour of the soil, the worth of fertilizer by the colour of the growing crops, the price and grade of fruits and vegetables by their rich hues, and the identification of meats by their colour. The importance of colour also permeates other industries. Commercially valuable minerals, for example, are selected by colour; raw wool, cotton, and silk are graded and priced according to colour; building stone, sand,gravel, lumber and plaster are colour graded; systems of electrical wires are colour coded; gas lines in natural gas plants are colour coded; vegetable oils are judged by colour; and office memorandums are sorted by colour.

Colour research is vital to modern business. It has been found that colours of consumer goods profoundly influence customer acceptance (Judd, 1963). It is colour that guides us to stop or proceed at traffic intersections. Colour is also symbolic for certain ceremonies in our society such as the wearing of black for funerals and white for weddings.

Lacking normal colour vision one may be hampered in or even disqualified from many occupations where hue discrimination is essential. These are a pilot, police officer, firefighter, locomotive engineer, ship's navigator, electronics expert, painter, paint mixer, dyer or printer in the textile industry, interior decorator, chemist, naturalist, geologist doctor or advertiser (Abbot, 1947; Gault, 1972; Kalmus, 1965; Wright, 1944). As Judd points out,

> A person whose colour vision deviates importantly from normal is more or less handicapped in the modern world. He cannot respond reliably to chromatic signals (traffic railroad, marine, airplane); he does not get full benefit from colour coding (office forms, telephone wires, safety markings, contents of pipes, identity of radio parts, and so forth) and certain jobs ... either are dangerous for him to undertake or place him at a severe disadvantage. (Judd, 1963, p. 76)

The Nature of Colour

"Colour stems from the nature and interrelationships of three elements: light, the source of colour; the material,

and its response to colour; and the eye, the perceiver of colour" (Mueller & Rudolph, 1966, p. 97).

Light

Light is that part of the electromagnetic spectrum (which ranges from very short gamma rays to miles long radio waves) that is visible to man. When white light is dispersed into its components, four bands of merging colour appear which are red (which has the longest wavelength), yellow, green, and blue (which has the shortest wavelength). Different light sources utilize different wavelengths. Fluorescent lights, because they have relatively little red, make articles under their influence seem blue whereas candlelight because it utilizes the red and yellow end of the spectrum radiates a warm rosy-yellow tone.

> Light is the only source of colour in the world. The ripest tomato, the most spectacular peacock, the gaudiest clown's costume - all are merely reflectors, absorbers and transmitters of one or more of the colours that make up light. Without it not even the faintest colour exists. (Mueller & Rudolph, 1966, p. 97)

The Materials

In order for light to produce colour it must be reflected by some material. Ten miles above the surface of the earth, the sky is black because the atmosphere is very

thin and light lacks a reflector. But, closer to the earth, sunlight passes through the atmosphere and molecules of gases scatter the light. The sky appears to be blue because the short wavelengths at the blue end of the spectrum are scattered to a greater extent than those at the red end of the spectrum (Mueller & Rudolph, 1966, p. 100).

Objects reflect or absorb different wavelengths. Simply stated, a leaf is green because its pigment molecules are arranged in such a way that they absorb the blue and red rays and reflect the green (Gault, 1972). If all wavelengths are reflected the result is white whereas if all are absorbed the result is black. All objects except light sources, therefore, are reflectors.

The Eye

The visual mechanism is the third vital element necessary for colour to be perceived. The human eye with its ability to see colours is an extremely complex organism. The ear has the capability to dissect a musical harmony and recognize its several constituent parts. The eye, however, is unable to discern the components of colour but sees only the resultant mixture (Rubin & Walls, 1965). If hearing worked in the same manner, two keys far apart could be struck on the piano and instead of hearing those two notes, a note of an unstruck key somewhere in between would be heard.

Colour is seen when a colour stimulus acts upon the colour receptors in the eyes. These in turn transform the wavelengths of radiant energy into nervous energy which is then differentially coded for transmission to the higher nerve centres of the brain (Bartleson et al., 1963; Burnham, 1971; Chapanis, 1965; Mueller & Rudolph, 1966). Following this physiological process, a psychological process occurs in which the brain interprets the signals and issues a colour response. This entire method is so poorly understood that it is still only possible to speculate about how colour responses are produced.

There are some 100 to 130 million receptors called rods and 6 to 7 million receptors called cones in the retina of the eye. The rods operate in low light intensities (night or scotopic vision) whereas the cones function in high light intensities (daytime or photopic vision) (Gault, 1972). The rods can respond to very small amounts of radiant energy. They are responsible for our ability to see by moonlight, starlight, or even with the stars obscured by clouds... The cones have a more complicated response than the rods. Instead of simply detecting light and dark and giving us a series of greys they also give us our perceptions of chromatic colour (Judd & Wyszecki, 1963, pp.9-10).

In conclusion, it may be stated that the colour of materials depends in part upon the quality of the illuminating light, in part upon the material's individual capacity for absorbing some wavelengths and reflecting others to the

observer, and in part upon the physiological and psychological interpretations of the incident rays by an individual (Trevor-Roper, 1974, p. 1974).

Theories of Colour Vision

A comprehensive and completely satisfactory theory of how the eye creates coloured worlds from radiant energy has not yet been developed. The process is vastly complex and there are presently insurmountable difficulties in experimenting with the human eye and brain (Judd & Wyszecki, 1963). Systematic attempts to explain the production of colour responses must account for the following:

a. the psychophysical aspects of colour vision (colour matching).

b. the physiological aspects of colour vision; that is, it must explain the action caused by the radiant energy absorbed within the receptors (rods and cones) of the retina and transferred into nerve impulses.

c. the psychological aspects of colour vision; that is, it must explain the nerve activities in the cortex leading to colour perception. (Judd & Wyszecki, 1963, p. 84)

Isaac Newton's discovery in 1666 that sunlight is actually white light which, when dispersed, displays all of the colours in the visible spectrum forms the basis for the various theories of colour vision. Interest developed

in the area of colour vision after publication of Newton's first edition of "Opticks" in 1704 in which he made several bold speculations and queries concerning colour vision. Almost a century later the subject was further pursued by a mathematic physician named Thomas Young. He began on the known premise that there exists three primary colours necessary to make all of the spectral hues. He sought for the explanation of this fact not in the nature of light but in the constitution of man. Reasoning that it was not possible for the eye to contain as many receptors as there were colours, he postulated the existence of three colour receptors (red, green and violet) each of which was sensitive to a specific colour. Young (1802) assumed that the retina of the eye was capable of mixing colours similar to the mixing of coloured lights on a screen.

Helmholtz (1910) revised and elaborated on Young's original trichromatic or three-receptor approach and this became known as the Young-Helmholtz theory. One modification made by Helmholtz involved the way in which the cones responded to colour. He suggested that a colour stimulus produces a strong sensation in one receptor and feeble sensations in the other two, therefore, pure red light stimulates the red receptor strongly and the green and violet receptors weakly, producing a sensation of red. Helmholtz also added to the theory the speculation that nerve impulses convey the impression of colour to the brain.

The Young-Helmholtz theory is represented in Figure 1.

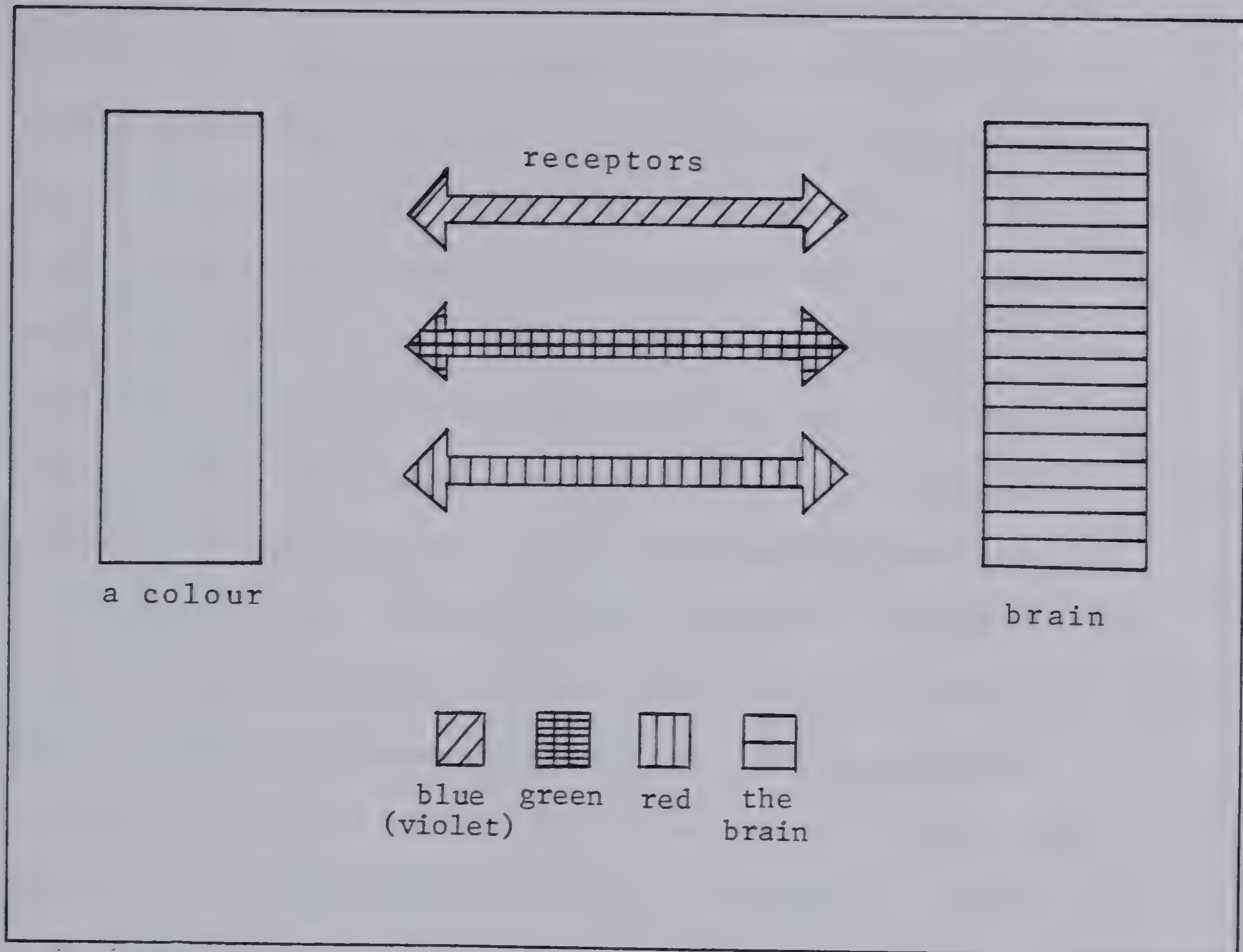

Figure 1. The Young-Helmholtz theory of colour vision. (Mueller & Rudolph, 1966, p. 130)

Ewald Hering, a German psychologist, believed that the trichromatic theory was in direct contradiction to actual visual experience. In the 1870's he formulated a rival theory of colour vision entitled the opponent-process theory. The two theories agreed only upon two points, those being first, that light of different colours can be mixed after entering the eye, and second, the number of colour receptors must be limited. The primary issue of contention between the two theories was the nature of the colour yellow. In the trichromatic theory yellow was considered a mixture of red and green light whereas in Hering's opponent-process

theory yellow became a colour in its own right. This deduction by Hering was based mainly upon the fact that red-green colour blind persons were unable to detect either red or green and yet they could perceive the colour yellow. The four primary colours according to Hering, therefore, were red, green, blue, and yellow. In addition, he theorized that "the retina's receptors are mere absorbers of light - what he called 'catching material' - and that colour discrimination begins in the coding mechanisms located further along the optic system" (Mueller & Rudolph, 1966, p. 33). These coding devices functioned in pairs of colours those being red-green, blue-yellow, and black-white. No member of the combination could be active in the same receptor at the same time as its complement. Individuals, therefore, are unable to perceive a bluish-yellow or a reddish-green. Black-white deviates somewhat in that it is able to send a combined signal producing intermediate shades of grey. All three types of colour coders receive light from indiscriminating receptors. "When red light is viewed, only the red portion of the red-green coder is stimulated. The green portion shuts down and does not send a green signal to the brain" (Mueller & Rudolph, 1966, p. 132).

Much of Hering's work resulted from studies of negative afterimages. For example, if a red stimulus to the eye is withdrawn, the red process stops and automatically

starts the opposing process, creating a green sensation. The graphic representation of the Hering theory is shown in Figure 2.

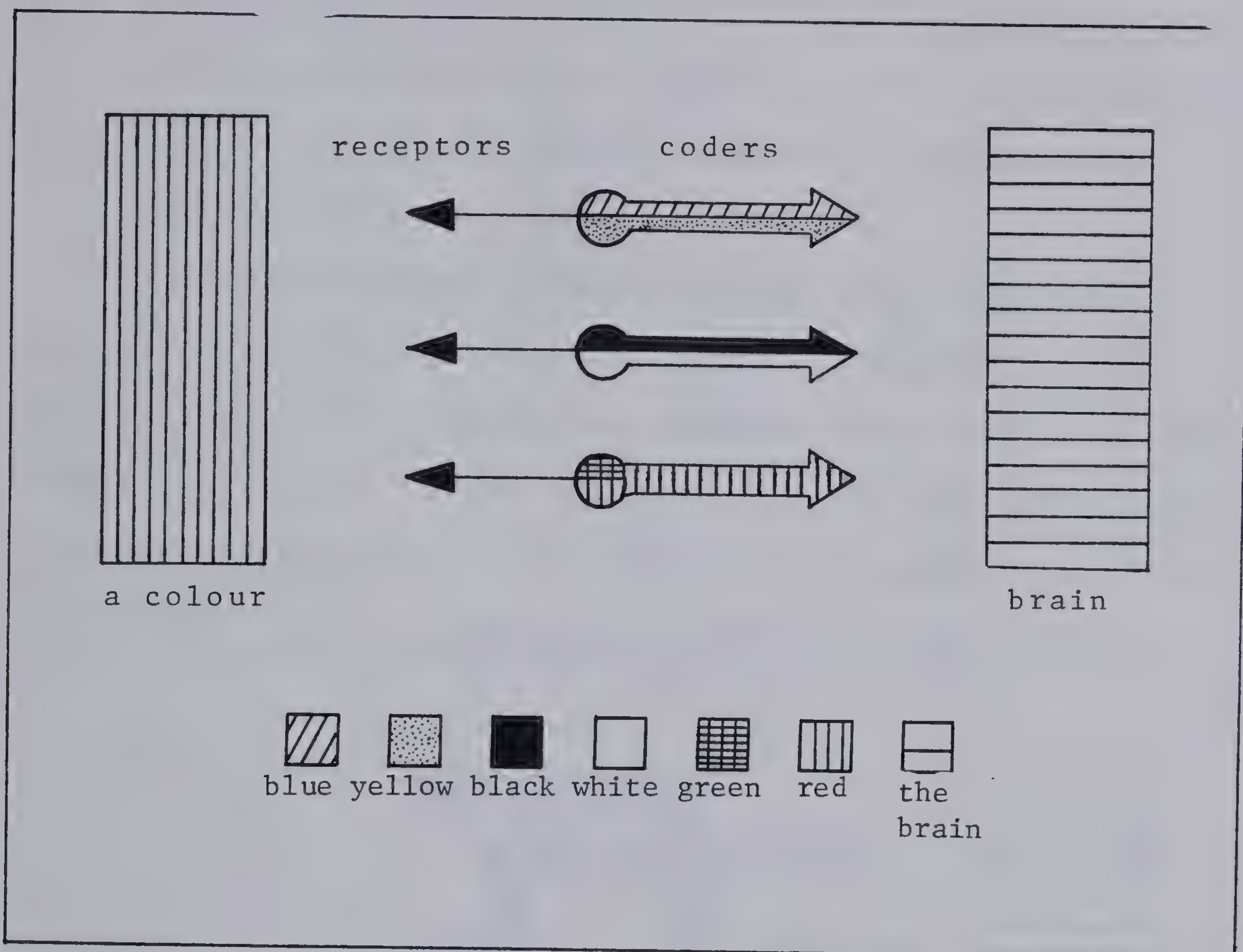

Figure 2. The Hering theory of colour vision.
(Mueller & Rudolph, 1966, p. 132)

New data have provided strong support for both of the major theories, thus it has become known as the composite theory which is summarized as follows:

> Colour vision is at least a two-stage process, consistent with the Young-Helmholtz theory at the receptor level and with the Hering theory at the level of the optic nerve and beyond. Each receptor does not

have its private route to the brain. Three colour information is somehow processed in the retina and encoded into two-colour on-off signals by each of the colour sensitive retinal ganglion cells for transmission to the higher visual centers. (Mueller & Rudolph, 1966, p. 125)

The colour yellow draws responses from both red and green receptors which in turn transmit impulses into the blue-yellow coder. The coder combines them into a yellow signal to be sent to the brain. If at the same time other coders are signalling a red colour, an orange hue will be perceived. This process is illustrated in Figure 3.

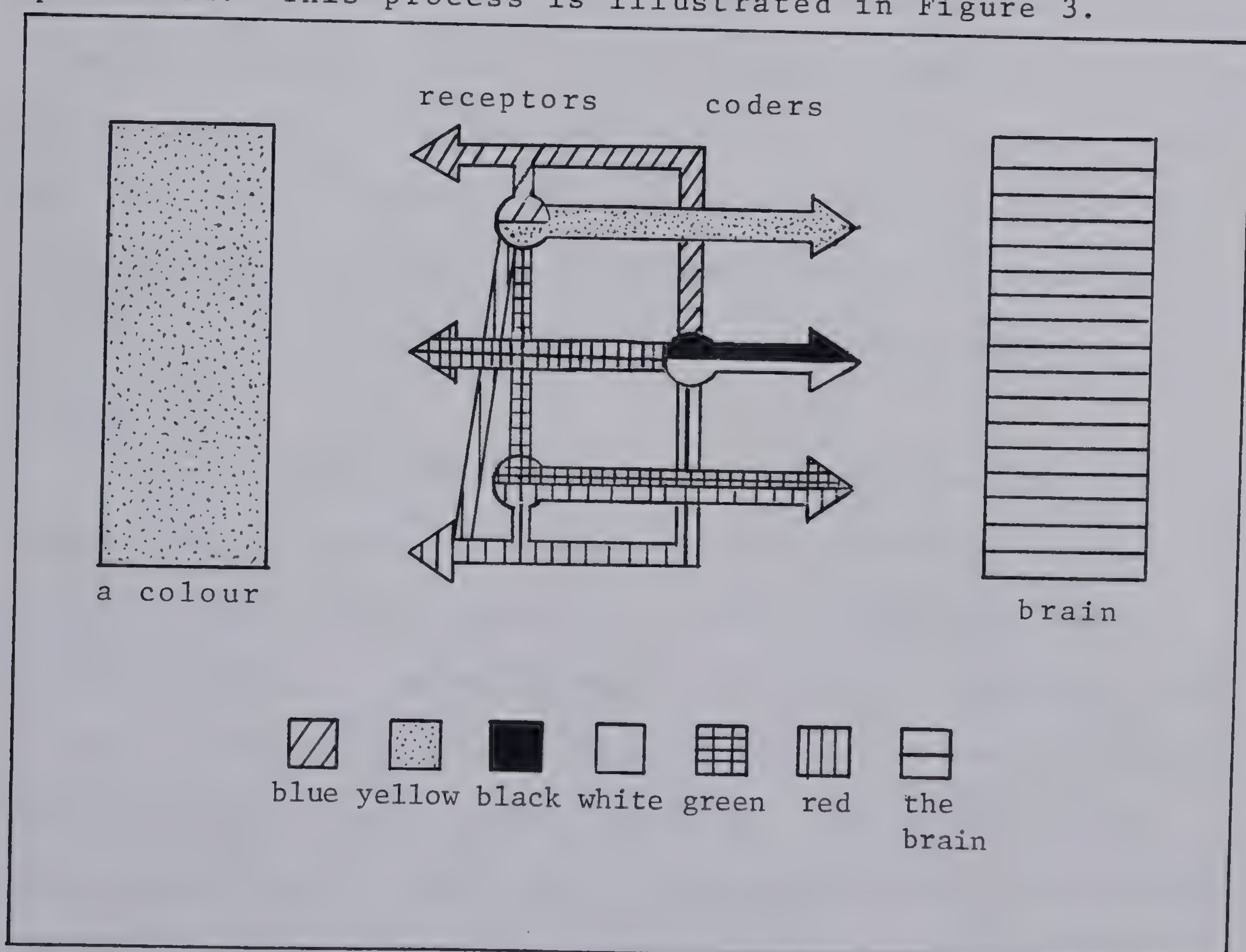

Figure 3. The composite theory of colour vision. (Mueller & Rudolph, 1966, p. 133)

Colour Blindness

The common term of colour blindness is misleading because it infers that afflicted persons are insensitive to all colours in the visible spectrum. It is the colloquial term for the various types and degrees of congenital and acquired colour defectiveness. The term is widely used even in scientific and medical circles, and therefore "colour blindness", as well as more specific terms for defectiveness, will be used interchangeably throughout this study.

John Dalton, a British physicist and chemist, who was himself red-green colour blind, first described the affliction in the latter part of the eighteenth century. For him, blood appeared to be the same colour as bottle green, mud, and wine (Gault, 1972). At that time and quite often in contemporary writings, as a result of Dalton's investigations on the subject, colour blindness became known as Daltonism.

Colour vision ability is generally divided into three major categories namely, trichromatic, dichromatic, and monochromatic (Bartleson et al., 1963; Cruz-Coke, 1970; Kalmus, 1965). A normally sighted person is referred to as a trichromat or one who is able to see all three of the primary colours of red, green, and blue (Cruz-Coke, 1970). Dichromats lack the ability to experience one of these three primary colours. There is a phychological relationship

between pairs of colours manifested in dichromatism. Individuals may lack the ability to see one of the colours red or green but because of the pairing effect of red-green, blue-yellow, and black-white, they will be unable to perceive both red and green. The most common form of colour blindness, dichromatism, is an abnormal colour vision system in which the afflicted individuals are capable of making two kinds of colour distinctions, those being light and dark, and either red-green or blue-yellow. Monochromatism, the third type of abnormal colour vision system, allows afflicted individuals to make only achromatic visual responses of one primary hue or no colour at all (Bartleson et al., 1963). All three types of colour deficiencies are further subdivided and can be measured quantitatively and qualitatively. It must be stressed that not all persons with a colour defect are completely insensitive to particular colours but may simply confuse tints and shades of the same hue, indicating a less severe form of colour blindness or a partial defect.

Queries by normal trichromats concerning the appearance of the world to a colour blind person have assisted in the understanding of the problem by those unaffected by it.

> Almost anything that looks coloured to the normal looks coloured to the colour blind also. The difference is that where the normal sees tens of thousands of colours (i.e., combinations of different hue, saturation, and

> brightness), the colour blind sees only hundreds.
> (Rubin & Walls, 1965, p. 121)

For one who is blue-yellow blind the spectrum appears in but two hues, red and green. According to the analogy made by Judd (1943) objects appear to a blue-yellow colour blind person as they do by candlelight to a normally-sighted person. For those with a less serious colour defect, colours such as maroon, crimson, and orange all appear the same (Gault, 1972). It is now possible to know what colours are seen by colour blind persons through information obtained from those with a unilateral defect which is usually an acquired colour defect found in one eye only.

> It would be difficult to exaggerate the importance of data obtained on unilaterally colour blind subjects. No ordinary colour blind subject can tell us how the colours he sees compare with those seen by a normal subject, but this is precisely what a unilateral colour blind subject can do. He can make a direct comparison of colours seen by his colour blind and normal eyes.
> (Graham & Yun Hsia, 1961, p. 146)

Adaption of colour defectives to their handicap seems to be almost complete. In their vocabulary dichromats learn that grass is green and apples are red whereas in their vision both may actually be grey. Often, improvision is necessary to distinguish certain objects from others. For example a red traffic signal may be identified by its

uppermost position among the three indicators, or pineapple and orange juices may be determined by their taste rather than by their colour (Gault, 1972; Le Grande, 1968). Colour defectives may also make judgements by discerning differences in brightness especially since they are more sensitive to contrast effects than the normal (Collins, 1925; Krill, 1967). By relying upon other cues, therefore, colour blinds learn to cope extremely well in our society.

Congenital Colour Blindness

The first description of a detailed investigation of twelve cases of congenital colour blindness was published in 1837 by Seebeck, establishing it as a mendelian, sex-linked, hereditary defect. In the instance of red-green colour blindness the mode of inheritance is illustrated in Figure 4.

The following is an explanation of Figure 4.

a. If the male is colour blind and the female is normal, all of their male offspring will be normal and all of their female offspring will be carriers of the gene for colour blindness.

b. If the male is normal and the female is a carrier of the gene for colour blindness, one half of their male offspring will be colour blind and the other half will be normal. One half of their female offspring will be normal and the other half will be carriers of the gene for colour blindness.

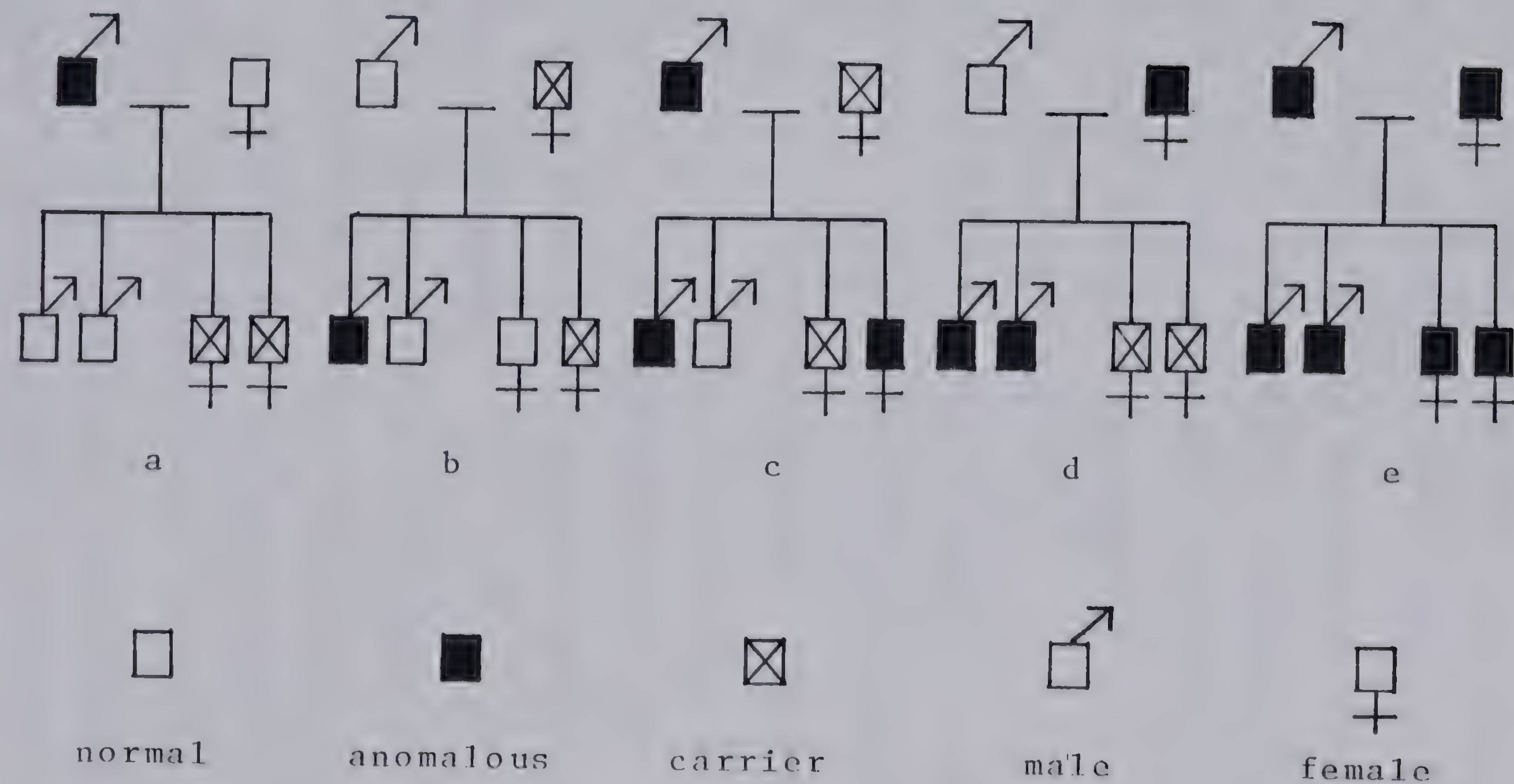

Figure 4. Inheritance of colour blindness. (Bartleson, Burnham & Hanes, 1963, p.99)

c. If the male is colour blind and the female is a carrier of the gene for colour blindness, one half of their male offspring will be colour blind and the other half will be normal. One half of their female offspring will be carriers of the gene for colour blindness and the other half will be colour blind.

d. If the male is normal and the female is colour blind, all of their male offspring will be colour blind and all of their female offspring will be carriers of the gene for colour blindness.

e. If both the male and the female are colour blind, all of their male and female offspring will be colour blind.

It was once believed that colour blindness could be cured but present indications are that it is incurable (Le Grand, 1968). It is generally not given serious concern because it is not believed to greatly affect life.

Acquired Colour Blindness

Although congenital colour blindness is much more prevalent, colour defects can also be acquired by such agents as disease and toxicities. The most common affecting disease is multiple sclerosis followed by pernicious anemia, leukemia, vitamin B deficiencies, optic neuritis of pregnancy, hemophilia, brain tumors and other disorders (Bartleson et al., 1963; Cruz-Coke, 1970). Acquired deficiencies may also result from the toxicity of certain drugs such as alcohol, tobacco, snuff, antibiotics, anti-

rheumatics, antituberculotics, antidepressants, carbon disulfide, lead, and spinal anesthesia (Bartleson et al., 1963; Cruz-Coke, 1972; Marre, 1973). In general, toxic agents or disease which affect the conducting parts of the visual pathway or the optic nerve cause acquired red-green weakness whereas those which affect the retina cause blue-yellow weakness. If the poison or disease persists the weakness may result in monochromatism (Bartleson et al., 1963). Unilateral colour blindness usually is an acquired rather than a congenital defect (Francois & Verriest, 1961).

As age increases acquired colour vision deficiencies also increase. The lens of the eye becomes more yellow, and, functioning like a filter, makes it increasingly difficult for the shorter wavelengths in the blue end of the spectrum to be absorbed. Thus, the older the person, the less one is able to discriminate blue, violet, and green hues (Hess, 1908; Linskz, 1964; Sharpe, 1964; Weale, 1963).

> It is well known that with many artists a colour change toward reddish values can be noted in later paintings. This can be attributed to the advance of a senile cataract. (Trevor-Roper, 1959, p. 139)

Many studies have been done to determine the effect of age upon colour vision. No general consensus has resulted concerning the age when the ability to detect hue differences declines. According to Gilbert (1957) after the age of 25 a decrease in colour discrimination ability is significant with

each decade. Lakowski (1958-59) suggested that many people after 30 years of age become less efficient in colour detection. Verriest (1963) found that colour ability was best in young adults and definitely and increasingly worse in the age group beyond 40. Pickford (1958-59) stated that yellow-blue colour vision tends to deteriorate in persons over about 40 years of age. According to Pastalan (1975) colour vision losses accelerate after the age of 50. Weale (1963) found that the colour sense declines only after the age of 55. Lakowski (1961), however, found that age has only the slightest effect on the most frequently used colour vision tests. This is possibly because the tests detect congenital red-green colour blindness and not blue-yellow colour blindness which is commonly acquired with age. The point of contention is the exact age at which the colour ability begins to fail, however, all agree that hue discrimination ability declines as age increases.

Frequency of Colour Blindness

In 1960, Dr. Hans Kalmus, organized a chart composed of the results of many international studies on the frequency of red-green colour blindness. It was found that among males in Western industrial societies, the frequency was among the highest at 8% to 11%. Among females from the same nations the occurrence was much less frequent at 1/2 of 1% (Kalmus, 1965; Rubin & Walls, 1965). There are reported to be more than 10 million people in the United

States with a red-green defect, many of whom are unaware of their affliction (Kherumian & Pickford, 1959). Furthermore about 16% of all mothers in the United States are genetic carriers of colour vision deficiencies (Judd, 1963).

A colour vision survey by Belcher, Greenshields and Wright (1958) was conducted to cull persons with defective colour vision from applicants to become drivers of public vehicles. From the sample of 500 persons, 11.3% were found to be colour defective. A study by Boice, Tinker, and Paterson (1948) carried out in the United States to determine the effects of age on colour vision resulted in a colour blind frequency rate of 10.6%. In men over the age of 60 the rate of incidence ranged from 15.8% to 23.8% with the average being 19.8%. Friberg (1974) conducted a study to determine men's colour preferences in clothing. A test was administered to detect and eliminate the colour blind men in her sample as being unrepresentative of the normal population of men. Six per cent of the Friberg sample were found to be colour defective.

Anthropological Approach to Colour Blindness

It has been established that the occurrence of colour blindness varies both among and within nations. The lowest rate occurs among indigenous peoples of Australia, Brazil, Fiji, and North America while the highest rate occurs in

the industrialized nations including North America, Europe, Japan and the Brahmin caste of India (Kalmus, 1965; Trevor-Roper, 1974). Seeking an explanation for this differentiated occurrence, Post (1962) suggested a selection-relaxation theory, which briefly stated is:

> Five thousand years ago, before the agricultural revolution, colour blindness genes were very rare and maintained in the population by a classical balance between mutation and natural selection. Colour blindness may be a serious handicap in primitive cultures of hunters and food gatherers and thus subject to selection. The agricultural revolution changed these conditions and probably natural selection against the mutant colour vision genes fell to zero, and consequently protan and deutan (red and green defects) genes started to increase by unchecked mutation. (Cruz-Coke, 1970, p. 108)

Primitive societies relied upon their discrimination abilities to identify certain essential features in their environment. Frugivorous people were able to distinguish fruit from leaves and to select ripe fruit from that which was over-ripe or unripe (Pickford, 1963). Hunters especially relied on keen auditory and visual senses in order to be successful in their quest for food. Post (1962) tested his theory and found a significant correlation between frequency of colour blindness and the distance in time of any population from the hunting and gathering phase of human existence.

As further evidence of this selection-relaxation theory Kherumian and Pickford (1959) found that within the Indian caste system, the highest caste of Brahmins, had the highest rate of colour blindness. Efficient colour vision, therefore, is believed to have been necessary for survival in primitive societies. Those with deficiencies did not exist long enough to reproduce and thereby transmit their defective genes.

An interesting hypothesis of Pickford (1965) suggests the continuing functioning of the selection theory today.

> At the present time the importance of red-amber-green signals for life and safety might lead to an increase in selection against the colour blind because road accidents might cause the deaths of more colour blinds than normal persons. (Pickford, 1965, p. 243)

Contradictory theories concerning the prevalence of colour blindness have also arisen. Ford (1965) does not believe the rise in defective genes can entirely be attributed to mutational forces, but instead suggests that they increased under the support of an adaptive advantage in a new habitat. Haldane (1949) asserted that in the past 5000 years, especially when men developed agriculture and lived in large groups, infectious diseases were the agents of natural selection. He theorizes that persons possessing the gene for colour blindness may have had an increased immunity to some infectious disease and thus their numbers rose.

Field Dependence And Perceptual Disembedding

The earliest investigations into the area of perception in relationship to human behaviour were done by Gestalt and his followers who wished to demonstrate the dependency of parts of a field on the field structure as a whole (Witkin, 1962). Deviating from Gestalt theorists, Witkin was concerned not with the commonalities but with the individual differences in the susceptibility to contextual effects. This interest lead him to develop and examine the concepts of Field Dependence and Field Independence.

Initially Witkin and Asch (1948) investigated the phenomenon of maintenance by humans of a proper orientation to the upright in space. Two speculations as to how this occurred resulted. The first proposed that individuals utilized their inner senses and the second suggested that individuals relied upon the surrounding environment for cues. A more Field Independent person was found to be able to keep an item, whether it be his own body, an external object, or a geometric figure, separate from a field or embedding context, whereas a more Field Dependent person was unable to do so.

The term Field Dependent and Field Independent were replaced by Global and Articulate as it became apparent that competence at disembedding in perceptual tasks was associated with the same competence in non-perceptual problem-solving tasks (Witkin, Oltman, Raskin, & Karp, 1971).

More recently the comprehensive term of Differentiation emerged upon determination that one's perceptual style was highly generalized. Individuals who are able to differentiate perceive a clear separation of what belongs to the self and what is external to the self.

> Development toward greater differentiation involves progress from an initial relatively unstructured state which has only limited segregation from the environment, to a more structured state, which has relatively definite boundaries, and which is capable of better specificity of function. (Witkin, Dyk, Paterson, Goodenough, & Karp, 1962, p. 22)

In spite of a change in terminology, Field Dependence is still an acceptable term.

The task of perceptual disembedding is consistent with one's mode of orientation to the upright in space. The Embedded-Figures Test was developed to measure the extent to which perception is influenced by the background in which an item occurs. It requires the person to disembed or separate a Simple Figure from the field in which it is incorporated. The Simple Figure is "hidden" to a greater or lesser degree in a larger, coloured, more complex figure. The test is a paper-and-pencil test in which the subject is given a mean score in seconds indicating his relative degree of Field Dependence or Field Independence with a high or a low score respectively.

It was pointed out by Witkin, Lewis, Hertzman, Machover,

Meissener, and Wapner (1954) that differentiation is an enduring mode of functioning which affects personality, percept of the self, view of others, and adjustment to situations. Friebert (1967) and Witkin (1068) also found that the Field Dependence-Independence perceptual style exists in persons with congenital defects of sense modalities such as the deaf and the blind. Combs (1959) stated that any type of physical handicap may affect the perceptual field by modifying the perceptions of the afflicted individual.

In spite of Witkin's emphasis on individual variations, some consistencies in Field Dependence have become apparent. Sex differences in which males tend to be more Field Independent than females, have repeatedly been found. These differences are not evident before the age of 8 or in geriatric populations (Witkin et al., 1971). Age related changes in Field Dependence occur over the life span. Field Independence increases between 8 and 15 years of age (Witkin, Goodenough, & Karp, 1967) after which a plateau effect occurs.

Many studies have sought to probe the origin of Field Dependence in individuals. One such study which examined early experiences within the family unit, established a relationship between differentiation and the fostering in children of separate autonomous function by parents (Witkin et al., 1971). Socialization experiences, however, do not

account for all of the variations in perceptual mode. Constitutional characteristics may also play a role. "As in the development of so many psychological characteristics, the product found appears to be the result of particular patterns of interaction between constitutional factors and socialization experiences" (Witkin et al., 1971, p. 12).

Little has been written concerning possible relationships between colour vision ability and perceptual disembedding competence. Birren (1961) states, "the colour sense aids perception. It has a functional basis. It was evolved by nature, not to make men happy but to assure better adaption to the environment" (p. 218). Colour defectives in this respect would seem to be perceptually handicapped. Contrary to this view, Pickford (1965) theorizes that colour blinds may have superior ability to cull relevant aspects from an embedding context.

> It is clear... that in hunting and food seeking, where camouflage of an animal depends on colour differences splitting up the creature's form and making it blend with the environment, the colour blind might sometimes have an advantage, as found during war time when colour blind men were used to identifying camouflaged buildings and other objects and installations. (p. 242)

CHAPTER III

METHODS AND PROCEDURE

The theoretical framework, procedure, selection of the sample, description of the instruments, directional rating of variables, and methods to be used for analysis of the data will be discussed in this chapter.

Theoretical Framework

The writings of several persons constitute the theoretical framework upon which this research was based. The expected percentage of colour blind males was adopted from the compilation of Kalmus (1960) of the international frequencies of red-green colour defectiveness. Judd (1963) asserted that colour blind persons were handicapped in the modern world. Combs (1959) stated that individuals with physical abnormalities (deaf, blind) may have perceptions which are slightly changed in character when compared to normal persons.

Witkin (1947) originated the perceptual concept of Field Dependence in which an individual's mode of determining the upright in space, whether it be the individual's inner senses or the field in which is the guide, was examined. Later studies indicated that a cognitive style in the former task was congruent with a cognitive style in perceptual disembedding tasks as well. The entire dimension of psychological functioning called Field Dependence has been found to be consistent for an individual through-

out a variety of perceptual, intellectual, and analytical tasks (Witkin et al., 1971). Birren (1961) and Pickford (1965) express opposite views concerning the perceptual disembedding abilities of colour blind persons. Birren states that the colour sense aids perception and therefore colour blinds are at a disadvantage whereas Pickford theorizes that colour blinds are not confused by background colours and therefore actually have an advantage. Both agree that colour blinds are different from colour normals in perceptual disembedding ability.

Procedure

The procedure of the study was as follows:

1. The Measure of Fabric Preferences was administered to 28 men to obtain split-half reliability on the instrument using the Pearson Product Moment Correlation.
2. The sample of colour normal men was selected from a variety of sources and advertisements were issued requesting colour blind men to participate.
3. The following tests were administered:
    a. Background Information
    b. Measure of Fabric Preferences
    c. Ishihara Pseudoisochromatic Plates
    d. Witkin's Embedded-Figures Test (Short Form)
4. The results were analysed descriptively and statistically.

5. The findings were interpreted with reference to the objectives, hypotheses, and theoretical framework.

Selection of the Sample

The sample of 27 colour normal and 27 colour blind men were selected using accidental and purposive (or judgement) sampling methods. Selection of the colour normal men was done by the former method mainly at the Canadian Superior Gas Plant at Harmattan, Alberta. A testing area was assigned in the Conference Room into which willing participants were ushered in their turn. Testing was done on two different days and yielded 16 and 4 volunteers respectively. Six men of normal colour vision from the University of Alberta Residence agreed to be subjects in the study. An advertisement requesting colour blind and colour normal men to participate in a study of colour and men's fabric preferences was placed in the campus newspaper called Folio for two consecutive weeks. One colour normal man responded to this advertisement.

The colour blind men in the sample were selected primarily by purposive sampling. This is based on hand picking individual elements in keeping with one's needs (Compton & Hall, 1972, p. 197). Four colour blind men responded to the advertisement placed in Folio. Sixty posters were placed in the various buildings on the University of Alberta campus requesting colour blind men to participate in a study involving colour and fabric pre-

ferences lasting approximately 15-30 minutes. Volunteers were asked to call the Graduate Students' office in the Home Economics Building to make an appointment. Subjects were informed that they would be paid a sum of $5.00. Nineteen colour blind men responded to these notices. One colour blind man was found in the course of testing the colour normal men. Three colour blind men who were referred to the author were contacted by telephone and asked to participate.

Description of the Instruments

Background Information (see Appendix A)

1. Age _______

2. According to recent literature, approximately 10% of Canadian men have colour defective vision. To your knowledge, have you ever had an eye examination which measured your colour vision?

   _________ yes _________ no (check one)

3. To your knowledge, do you have a colour vision defect?

   _________ yes _________ no (check one)

Ishihara Pseudoisochromatic Plates

Colour vision tests are generally divided into the following categories:

1. Simple screening tests designed to separate subjects with defective colour vision from those with normal colour vision.

2. Qualitative diagnostic tests designed to classify the type of defective colour vision.
3. Quantitative diagnostic tests designed to indicate the extent of the defect in colour vision.
4. Aptitude or special tests designed to determine a subject's relative fitenss for a particular vocation. (Hardy, Rand, & Rittler, 1954, p.510)

The Ishihara Plates were recommended for this study by Dr. J. Lampard, an Edmonton optometrist. They were designed to give a quick and accurate assessment of colour vision deficiency of congenital origin (Ishihara, 1974) and were used for the purposes of this study as a simple screening device. Thirty-eight plates constitute the entire test but it is unnecessary in all cases to administer the complete series. Plates numbered 1-21 are sufficient providing that all of the participants are literate and the test is not being used for a qualitative assessment. The last group of plates are designed with geometric figures and shapes to be used for those subjects who are unable to read English letters or for pre-school children who are unable to read. The Ishihara Pseudoisochromatic Plates or confusion charts contain backgrounds of coloured dots among which a figure can be traced in dots of a different colour, apparent to the normal but misinterpreted by the colour defective (Cruz-Coke, 1970). The plates are shown in a combination of daylight and artificial light which is

standardized to ensure more accurate test results. Each Plate is held 75 centimeters from the subject at a right angle to the line of vision.

Oral responses of the figure seen by the subject are expected to be given within three seconds of initial exposure and are noted on a record sheet. The typical readings of both normal and defective persons are tabulated on a chart in the Manual (see Appendix B). If 17 or more plates are read normally, the colour vision is regarded as normal. If 13 or less of the plates are read normally, the colour vision is regarded as deficient. It is rare to find persons whose recordings of normal answers are between 14 and 16 plates and if such cases occur, they are listed as "borderline". Information given to each subject concerning the measure appears in Appendix C.

Measure of Fabric Preferences

The Measure of Fabric Preferences was fashioned somewhat similarly to the Compton Fabric Preference Test for women. For ease in comparison, the test developed by Compton (1966) will be briefly explained at the beginning of this section.

The test includes 5 variables, 3 of which involve colour (a. saturated hue, tint, shade b. strong and weak figure ground contrast c. warm and cool colours), 1 for design size, and 1 for textures. The fabrics were arranged on cards and the subjects were required to choose

either fabric "A" or fabric "B" from each card. Later, slides were taken of all of the fabric cards and these were randomized so that subjects were unaware of the specific variable being tested. One point was given for each selection and the points were totaled for each variable. A score of 10-12 was considered to be a strong preference for saturated hue, tint, and shade and a score of 12-15 was considered a strong preference for strong and weak figure ground contrast, warm and cool colours, design size, and texture.

Test-retest reliability was done in which 27 students participated and there was a lapse of 1 month between testings. Reliability coefficients using the Pearson Product Moment Correlation method were: 0.70 for saturated colours, 0.74 for tints, 0.82 for shades, 0.85 for warm and cool colours, 0.86 for large and small designs, and 0.68 for rough and smooth textures (Compton & Hall, 1972, p. 288).

a. Development of the Test

The Measure of Fabric Preferences was developed for this research to determine individual men's partiality to certain fabrics for their personal clothing. The 4 major variables involved comparative choices between: patterned and plain fabric, large designs and small designs on fabric, tint and shade fabric, and textured and smooth fabric. There were 32 cards in all and each card contained 2 fabrics which were 4" (102 mm) x 6" (153 mm) (see Appendix D). One of the fabrics on each card was labelled "A" and the

other labelled "B". Fabrics on the left side of the card and labelled "A" were the patterned, large design, tint, and textured fabrics. Fabrics on the right side of the card and labelled "B" wre the plain, small design, shade, and smooth fabrics. Each of the 4 major variables was represented by 8 cards which were subdivided according to colour. To prevent choices by colour only each of the 4 primary colours (red, blue, yellow, and green) was equally represented so that there were 2 cards of each colour for each variable. Fabrics on 1 card were the same colour or were tints and shades of the same hue. In 1 group of 8 cards, therefore, there were 2 cards each containing 2 red fabrics, 2 cards containing 2 blue fabrics, 2 cards with 2 yellow fabrics and 2 cards with 2 green fabrics. All of the cards in the group of 8 had 1 fabric on the left labelled "A", for example patterned fabric, and 1 fabric on the right labelled "B" of plain fabric.

All of the fabrics used for the test (with the exception of tints and shades) were either purchased on the local market or donated by men's clothing stores and tailors in Edmonton, Alberta. The tinted and shaded fabrics were created from white 100% cotton fabric and Dylon cold water dyes. Two red, 2 blue, 2 yellow, and 2 green dyes were selected which represented a bright and a dull version of the same hue, for example, scarlet and maroon were selected for the colour red. An equal amount of white dye was added to each of the 8 colours to create the tinted fabrics and an equal

amount of black dye was added to each of the 8 colours to create the shaded fabrics.

b. Order of the Cards

In order to perform a split-half type of reliability on the Measure of Fabric Preferences, it was divided into 2 equal sections and the cards were numbered from 1-16 and from 17-32. Each section contained 4 cards from each of the 4 major variables of patterned-plain, large- small design, tint-shade, and textured-smooth fabrics. Each of these 4 major major divisions was represented by 1 card from each of the 4 primary colours of red, blue, yellow, and green. Thus there were 16 cards in the first half of the test and a comparatively equal 16 cards in the second half of the test.

All of the cards in each section were placed in the following order:

i. patterned and plain cards - red, blue, yellow, and green

ii. large and small design - red, blue, yellow, and green

iii. tints and shades - red, blue, yellow, and green

iv. textured and smooth - red, blue, yellow, and green

The cards were then temporarily numbered on the back in pencil. To randomize the first group of 16 cards, numbers from 1 to 16 were placed on small pieces of paper. These slips of paper were placed in a container and the container was rotated to mix the order of the numbered papers. The

papers were then drawn out of the container one at a time and the numbers on the papers were matched to the numbers on the cards. The cards were arranged in the identical order as the slips of paper were drawn from the container. Each card was then permanently numbered in the upper right hand corner. The same procedure was followed to randomize the cards from numbers 17 to 32.

c. Administration of the Test

The test was designed so that the subject had to choose either fabric "A" or fabric "B" from each card and then state the degree of his preference by circling number 1, 2, 3, 4, or 5 which corresponded to the preferences very slight, slight, moderate, strong, and very strong respectively. The total for each variable represented the subject's relative degree of preference for that particular textile characteristic.

Prior to the testing, participants were given some basic information concerning its content and its intent (see Appendix C).

d. Validity

Content validity, based upon the judgements of others as to the appropriateness of the test items, was done on the Measure of Fabric Preferences. In order to establish that the test was examining preferences between the 4 primary groups of patterned-plain, large design-small design, tint-shade, and textured-smooth, 2 clothing and textiles instructors at Olds College were asked to place the cards

into 4 piles of the groups stated previously. In addition, they were asked to comment on the appropriateness of the cards in each of the groups. Both correctly placed all of the cards and agreed that the fabrics were appropriate. It was concluded that the test was valid.

e. Reliability

To examine consistency on the Measure of Fabric Preferences, an assessment was made on the internal degree of association among the variables (or split-half reliability). The test was divided into 2 sections each containing 16 cards. There were 4 cards from each major variable (patterned-plain, large-small designs, tints-shades, textured-smooth) and each represented one of the 4 primary colours (red, blue, green, and yellow). Scores for each variable on the first half of the test were correlated with scores for the same variable on the second half of the test using the Pearson Product Moment Correlation. This is a measure of the strength of a relationship. The value of the correlation coefficient would be equal to plus 1 (a perfect direct correlation) or minus 1 (a perfect inverse correlation) if all points on the scatter diagram were on a straight line. A correlation is judged high or low in absolute terms as it reaches its numerical limits. Hence, $r = 0.9$ is a high correlation whereas $r = 0.2$ is a low correlation (Mueller; Schuessler; & Costner, 1971, p. 340). To increase the reliability to compensate for the small number of test items, the Spearman-Brown formula was applied.

At the time that the pre-test was done, the degrees of preference and their related scores were: slight = 1, moderate = 3, and strong = 5. These were later modified and expanded to: very slight = 1, slight = 2, moderate = 3, strong = 4, and very strong = 5. Twenty-eight men from the academic and nonacademic staff at Olds College participated in the pre-test. During subsequent testing the sample consisted of 54 men from Edmonton, Alberta. All correlation coefficients and probabilities appear in Table I.

Correlations for the pre-test (n = 28) ranged from r = 0.22 for textured fabrics to r = 0.68 for shade fabrics using the Pearson Product Moment Correlation. The Spearman-Brown formula yielded correlations ranging from r = 0.45 for textured fabrics to r = 0.81 for shade fabrics. Correlation coefficients for plain fabric and large designs were significant at the 0.05 level, patterned fabrics, small designs, and tintswere significant at the 0.01 level, and shades, textured, and smooth fabrics were significant at the 0.001 level. Correlations for the test (n = 54) using the Pearson Product Moment Correlation ranged from r = 0.42 for large designs to r = 0.71 for shade fabrics. These were augmented to r = 0.59 and r = 0.83 for large designs and shade fabrics respectively by applying the Spearman-Brown formula. Correlation coefficients for small designs and tints were not significant, shades were significant at the 0.05 level, patterns at the 0.01 level and plain, large design, textured and smooth

Table I

Split-half Reliability Coefficients an Probabilities on Measure of Fabric Preferences for Pre-test and Test

Variable	Pearson Product Moment Correlation		Spearman-Brown Formula	
	Pre-test	Test	Pre-test	Test
	n = 28	n = 54	n = 28	n = 54
Pattern	r = 0.65 p = 0.00 **	r = 0.45 p = 0.00 **	r = 0.79 p = 0.00 **	r = 0.62 p = 0.00 **
Plain	r = 0.54 p = 0.02 *	r = 0.45 p = 0.00 ***	r = 0.70 p = 0.02 *	r = 0.62 p = 0.00 ***
Large design	r = 0.49 p = 0.02 *	r = 0.42 p = 0.00 ***	r = 0.66 p = 0.02 *	r = 0.59 p = 0.00 ***
Small Design	r = 0.62 p = 0.01 **	r = 0.57 p = 0.53	r = 0.76 p = 0.01 **	r = 0.73 p = 0.53
Tint	r = 0.66 p = 0.00 **	r = 0.64 p = 0.09	r = 0.79 p = 0.00 **	r = 0.78 p = 0.09
Shade	r = 0.68 p = 0.00 ***	r = 0.71 p = 0.05 *	r = 0.81 p = 0.00 ***	r = 0.83 p = 0.05 *
Textured	r = 0.29 p = 0.00 ***	r = 0.70 p = 0.00 ***	r = 0.45 p = 0.00 ***	r = 0.82 p = 0.00 ***

continued...

Table I - Continued

Variable	Pearson Product Moment Correlation		Spearman-Brown Formula	
	Pre-test	Test	Pre-test	Test
Smooth	$r = 0.51$ $p = 0.00$ ***	$r = 0.54$ $p = 0.00$ ***	$r = 0.68$ $p = 0.00$ ***	$r = 0.70$ $p = 0.00$ ***

Note:

* $p \leq 0.05$

** $p \leq 0.01$

*** $p \leq 0.001$

fabrics at the 0.001 level.

The differences in the scoring on the Likert scale for the pre-test and test may account for some of the variability in the degrees of association between the two administrations. The correlation is relatively low for textured fabrics on the pre-test. It would seem that all textures should have been selected for the test with a more conventionally masculine taste in mind. The men tended to choose a texture only if it was deemed sporty or unfeminine. For example, some men would prefer the tactile sensation of the velveteen but would not select it for their personal clothing whereas the more "masculine" corduroy was frequently chosen over the smooth fabric of the same colour. A similar rationale seemed to have applied to the preference for a large or small design on fabric during the testing which may at least partially account for the low correlation for that variable. Fabrics such as floral prints and polka dots were considered feminine by some of the men in the sample. They tended to select, therefore, the one they thought would be least conspicuous. If a bold plaid, stripe or some other more suitably masculine fabric was substituted, the responses for the variable may have been more consistent.

Embedded-Figures Test (Short Form)

The Embedded-Figures Test was designed to determine an individual's ability to separate an item from the field in which it is incorporated and is represented by polar

extremes on a continuum designated by Witkin (1962) as Field Dependence and Field Independence. The black and white figures in the test, adapted from those developed by Gottschaldt (1926) were rendered more confusing by superimposing colour on to the figures.

The test consists of "3 sets of cards: Two sets of 12 cards with simple figures, numbered consecutively in order of test presentation, and a set of 8 cards with simple forms, designated by letters 'A' to 'H'" (Witkin et al., 1971, p. 45). Administration of the entire test need not be done because according to Witkin (1962) the first 12 items in the standard order of presentation provide as reliable a measure as any 12 items drawn from the total set.

The subject is presented with a complex figure for a period of 15 seconds after which it is withdrawn and the simple figure which is incorporated into the complex figure, is shown for a period of 10 seconds. The task of the subject is to detect the simple figure found in the complex figure within a time limit of 3 minutes. The 2 figures are never shown simultaneously. The simple figure may be re-presented to the subject upon request at any time during the trial and as many times as the person wishes to view it. The procedure in this case is to conceal the complex figure, reveal the simple figure for 10 seconds, then having removed the latter from view, replace the

complex figure. The seconds taken to re-observe the simple figure are not tabulated with the subject's score. A mean score in seconds for the 12 trials of 1 set of complex figures comprises the score for the test. A high score is indicative of Field Dependence and a low score is indicative of Field Independence.

Reliability of the full Embedded-Figures Test (24 items) for an interval of 3 years using test-retest correlations are r = 0.89 (men) and r = 0.89 (women) (Bauman, 1951). Dana and Goocher (1959) reported a test-retest correlation of r = 0.92 after an interval of one week. Jackson (1956) reported correlations in the mid-nineties between the short form (12 items) and the full scale Embedded-Figures Test for several groups of subject.

Information given to subjects concerning the Embedded-Figures Test appears in Appendix C and is taken from the 1971 Embedded-Figures Test Manual.

Directional Rating of Variables

Table II gives the directional rating of all the variables and the possible range of scores.

Table II

Directional Rating of Variables

Variable	Range	High Score	Low Score
Age	18-52	older	younger
Patterned fabric	0-40	strong preference	slight preference
Plain fabric	0-40	strong preference	slight preference

continued...

Variable	Range	High Score	Low Score
Large design	0-40	strong preference	slight preference
Small design	0-40	strong preference	slight preference
Tint	0-40	strong preference	slight preference
Shade	0-40	strong preference	slight preference
Textured fabric	0-40	strong preference	slight preference
Smooth fabric	0-40	strong preference	slight preference
Colour vision ability	0-21	colour normal	colour defective
Field Dependence	0-2160 seconds	Field Dependent	Field Independent

Analysis of Data

The data were analysed using both descriptive and statistical techniques. The Pearson Product Moment Correlation and Spearman-Brown formula were used to determine split-half reliability on the Measure of Fabric Preferences. Background information on all subjects was tabulated in the form of frequency distributions and other descriptive statistics such as percentages, means, medians, and standard deviations were reported. The Pearson Product Moment Correlation was used to measure the degree of association between the variables: perceptual disembedding ability and fabric preferences, and age and perceptual disembedding ability. Analysis of variance was used to measure the mean differences

among age groups on fabric preferences and between colour normal and colour blind men on fabric preferences and perceptual disembedding ability. Fabric preferences and perceptual disembedding ability were interval data whereas colour vision was nominal data. A significance level of 0.05 was utilized throughout the study.

CHAPTER IV

FINDINGS

The descriptive and statistical analyses of the data will be presented in this chapter. In view of the fact that the sample was non-random, the statistics used refer to the sample specific and inferences concerning the population can not be made. The chapter is organized as follows: description of the sample, descriptive analysis of the data, statistical analysis of the data, and acceptance or rejection of the null hypotheses.

Description of the Sample

The non-random sample consisted of 54 men in total, 27 with normal colour vision and 27 with a red-green colour defect. All testing took place during the latter part of July and the first three weeks in August of 1979. The colour normal men consisted of 20 office staff and plant workers from the Canadian Superior Gas Plant at Harmattan, Alberta. These included engineers, power engineers and maintenance staff. Six colour normal men were adult Summer Session students housed in the University of Alberta Residence, and 1 man was an instructor at the University of Alberta. The colour blind sample was composed of Instructors, graduate students, and Summer Session students at the University of Alberta, a truck driver, a bus driver, a recreation director, an engineer, a doctor, and an architect. Occupation was not requested as part of the Background Information and, therefore, a frequency table is not presented.

Testing of the colour normal men at the Harmattan plant took place in the conference room which provided the necessary combination of artificial and natural daylight required for the administration of the Ishihara Plates. Testing in the university residence occurred in a sun lounge which also afforded artificial and natural lighting. Most of the colour blind men (with 1 exception) and 1 of the colour normal men were tested in the Home Economics building on the University of Alberta campus. Subjects were situated so that daylight entered the room from behind and artificial light from above.

Each subject was interviewed on an individual basis since the nature of the measures disallowed group testing. The time taken to administer the tests ranged from 25 - 45 minutes for the colour normal men with the average being approximately 30 minutes. Using this as a guide, 30 minutes was scheduled for the colour blind men as well. After the first few trials, however, it became apparent that this time allotment was inadequate. Because of their vested interest in the study, and their lack of information concerning their own affliction, it was found that the colour blind men requested more information and required additional time. Their testing time, therefore, ranged from 30 - 90 minutes with an average of approximately 60 minutes.

The colour normal participants ranged in age groups from 15 - 19 to 50 - 54 with a mean age of 32 (30 - 34), a median age of 32 (30 - 34) and a standard deviation of 7.6.

The colour blind men ranged in age groups from 15 - 19 to 50 - 54 with a mean age of 30 (30 - 34), a median age of 30 (30 - 34), and a standard deviation of 7.7. Table III illustrates the frequency and percentage distributions of the age groups for the colour normal and colour blind men in the sample.

One of the questions in the Background Information inquired whether or not the subject had previously undergone a colour vision test. Twelve colour normal men had not formerly been tested while 15 had at one time had their colour vision assessed. Twenty-six out of the 27 colour blind men in the sample had previously had their colour vision examined. The men were also asked whether they were aware of their colour vision condition. This query was posed in order to aid the researcher in the event that a man, who was unaware of the fact, was found in the course of the testing to be colour blind. It was decided that the tester, in this situation, would inform the subject briefly and tactfully of his defect and suggest that for more complete and qualitative information he should consult with an opthalmologist. This situation, however, was not encountered because the colour blind men were specifically asked to volunteer and therefore were aware of their defect. The 1 man who had never been formally tested knew of his problem. Frequencies and percentages of the former two questions appear in Table III.

TABLE III

Frequency and Percentage Distributions, and Measures of Central Tendency for Colour Blind and Colour Normal Men on Background Information

Characteristic	Frequency		Percent	
	c.n.[a]	c.b.[b]	c.n.	c.b.
	n = 27	n = 27	n = 27	n = 27
Age Group in Years				
15 - 19	2	1	7.4	3.7
20 - 24	2	7	7.4	25.9
25 - 29	2	5	7.4	18.5
30 - 34	13	11	48.2	40.8
35 - 39	4	1	14.8	3.7
40 - 44	2	0	7.4	0
45 - 49	1	1	3.7	3.7
50 - 54	1	1	3.7	3.7
Total	27	27	100.0	100.0
Previous Colour Vision Test				
yes	12	26	44.4	96.3
no	15	1	55.6	3.7
Total	27	27	100.0	100.0

continued ...

Table III continued

Characteristics	Frequency		Percent	
	c.n.	c.b.	c.n.	c.b.
	n = 27	n = 27	n = 27	n = 27
Knowledge of Colour Blindness				
yes	0	27	0	100
no	27	0	100	0
Total	27	27	100	100

Note: [a]c.n. - colour normal

[b]c.b. - colour blind

Colour normal mean age was 32 (30-34), median 32 (30-34), standard deviation 7.6

Colour blind mean age was 30 (30-34), median 30 (30-34), standard deviation 7.7

Descriptive Analysis of the Data

The descriptive statistics which apply to men's fabric preferences are discussed first followed by the data which applies to perceptual disembedding ability. Table IV gives the scores, measures of central tendency, and variability for each of the variables on the Measure of Fabric Preferences for the 54 men in the sample. The highest possible score on each variable was 2160. This would occur if the variable was selected by every subject every time it was presented (8 times), and was assigned the highest preference on the Likert scale (very strong - 5) each time. The actual scores ranged from a low of 338 for pattern fabrics to a high of 820 for plain fabrics. Using the rank order of scores, men's fabric preferences were as follows from least to most preferred: pattern, large design tint, textured, small design, shade, smooth, and plain. The means ranged from a low of 6.3 for pattern fabric to a high of 15.2 for plain fabric out of a possible high of 40. These scores could not be compared to others since the Measure of Fabric Preferences was specifically developed for the present study.

Table V indicates the measures of central tendency for men's fabric preferences by age group. Some differences occurred among the groups. For example, men in their late teens ranked tint as the most preferred fabric while men in their late 30's ranked tint as the least preferred and shade was placed in the highest position of preference. Men in

Table IV

Scores and Measures of Central Tendency and Variability for Variables on the Measure of Fabric Preferences

Fabric Preferences	Score (2160)[a]	Range (0-40)[b]	Mean	Median	Standard Deviation
	n = 54	n = 1	n = 54	n = 54	n = 54
Pattern	338	0 - 20	6.3	5.3	5.1
Plain	820	0 - 33	15.2	16.0	6.8
Large Design	390	0 - 24	7.2	6.5	5.7
Small Design	592	2 - 30	11.0	9.5	6.2
Tint	443	0 - 28	8.2	7.4	6.8
Shade	631	0 - 28	11.7	10.5	7.5
Textured	508	0 - 28	9.4	8.5	6.5
Smooth	699	0 - 25	13.0	13.3	6.0

Note: [a]Total possible score = 2160

[b]Total possible range = 0-40

Table V

Means and Standard Deviations for Scores on Measure of Fabric Preferences for Entire Population and Individual Age Groups

Variable	n	Pattern		Plain		Large Design		Small Design		Tint		Shade		Textured		Smooth	
		$\bar{x}$[a]	s.d.[b]	$\bar{x}$	s.d.	$\bar{x}$	s.d.	$\bar{x}$	s.d.	$\bar{x}$	s.d.	$\bar{x}$	s.d.	$\bar{x}$	s.d.	$\bar{x}$	s.d.
Population	54	6.3	5.1	15.2	6.8	7.2	5.7	11.0	6.2	8.2	6.8	11.7	7.5	9.4	6.5	13.0	6.0
Age Group in years																	
15-19	3	4.7	6.4	14.0	2.7	8.0	4.6	12.3	9.5	15.0	11.4	4.7	5.0	9.3	5.5	12.0	6.9
20-24	9	5.4	5.4	15.1	6.2	7.9	3.6	9.3	4.2	5.8	6.2	14.4	7.1	8.9	5.8	12.6	3.8
25-29	7	5.2	1.4	14.9	6.2	8.6	4.0	8.9	6.2	14.1	5.7	9.9	8.2	11.4	5.2	12.0	7.3
30-34	24	7.3	6.1	15.8	7.8	7.0	7.4	11.3	6.5	8.0	6.5	11.3	7.9	9.2	7.4	12.1	6.7
35-39	5	6.6	1.7	13.6	6.8	4.2	4.2	13.4	7.1	2.8	3.8	16.8	6.8	8.6	4.8	14.4	3.5
40-44	2	10.5	0.7	7.0	0.0	6.0	4.2	11.5	3.5	9.0	0.0	11.0	1.4	17.5	0.7	3.5	0.7
45-49	2	.5	.7	22.5	5.0	10.0	7.1	7.5	6.4	6.0	4.2	8.5	2.1	0.0	0.0	20.5	0.7
50-54	2	3.5	3.5	16.5	2.1	6.5	2.1	16.5	7.8	5.5	6.4	12.0	8.5	10.5	5.0	15.5	2.1

Note: [a] $\bar{x}$ - mean
[b] s.d. - standard deviation

their early 40's preferred textured fabric most whereas men in their late 40's preferred it least. Pattern was the least preferred fabric for men in their early 20's, late 20's, and early 50's making it the most common least preferred fabric. Men in their early 30's ranked the large design lowest and men in their early 40's designated smooth fabric as their lowest preference. Plain fabric was the most preferred among the highest number of age groups those being the early 20's, late 20's, early 30's, late 40's, and early 50's.

Scores and measures of central tendency for fabric preferences are subdivided between colour normal and colour blind men in Table VI. Colour normal men's preferences from least to most preferred were pattern, large design, tint, textured, small design, shade, smooth, and plain fabric. Colour blind men differed only slightly in that their preference for tint was placed higher and their preference for textured ranked lower. Their order of preferences from least to most preferred was pattern, large design, textured, tint, small design, shade, smooth, and plain fabric. Mean scores for colour normal and colour blind men ranged from lows of 6.9 and 5.6 respectively for pattern fabric to highs of 14.6 and 15.8 respectively for plain fabric.

Mean scores for each of the 12 trials on the Embedded-Figures Test for the entire sample is graphically represented in Figure 5. Clearly there were some trials which

Table VI

Sums of Scores and Measures of Central Tendency for Colour Normal and Colour Blind Men on Measure of Fabric Preferences

Fabric Preferences	Total Scores (1080)[a]		Mean		Standard Deviation	
	c.n.[b]	c.b.[c]	c.n.	c.b.	c.n.	c.b.
	n = 27	n = 27	n = 27	n = 27	n = 27	n = 27
Pattern	186	152	6.9	5.6	5.6	4.5
Plain	394	426	14.6	15.8	7.1	6.5
Large Design	189	201	7.0	7.4	5.7	5.8
Small Design	300	292	11.1	10.8	6.2	6.3
Tint	214	229	7.9	8.5	6.3	7.4
Shade	306	325	11.3	12.0	6.6	8.4
Textured	288	220	10.7	8.2	6.7	6.1
Smooth	315	384	11.7	14.2	5.7	6.2

Note: [a] Total possible sum of scores = 1080
[b] c.n. - colour normal
[c] c.b. - colour blind

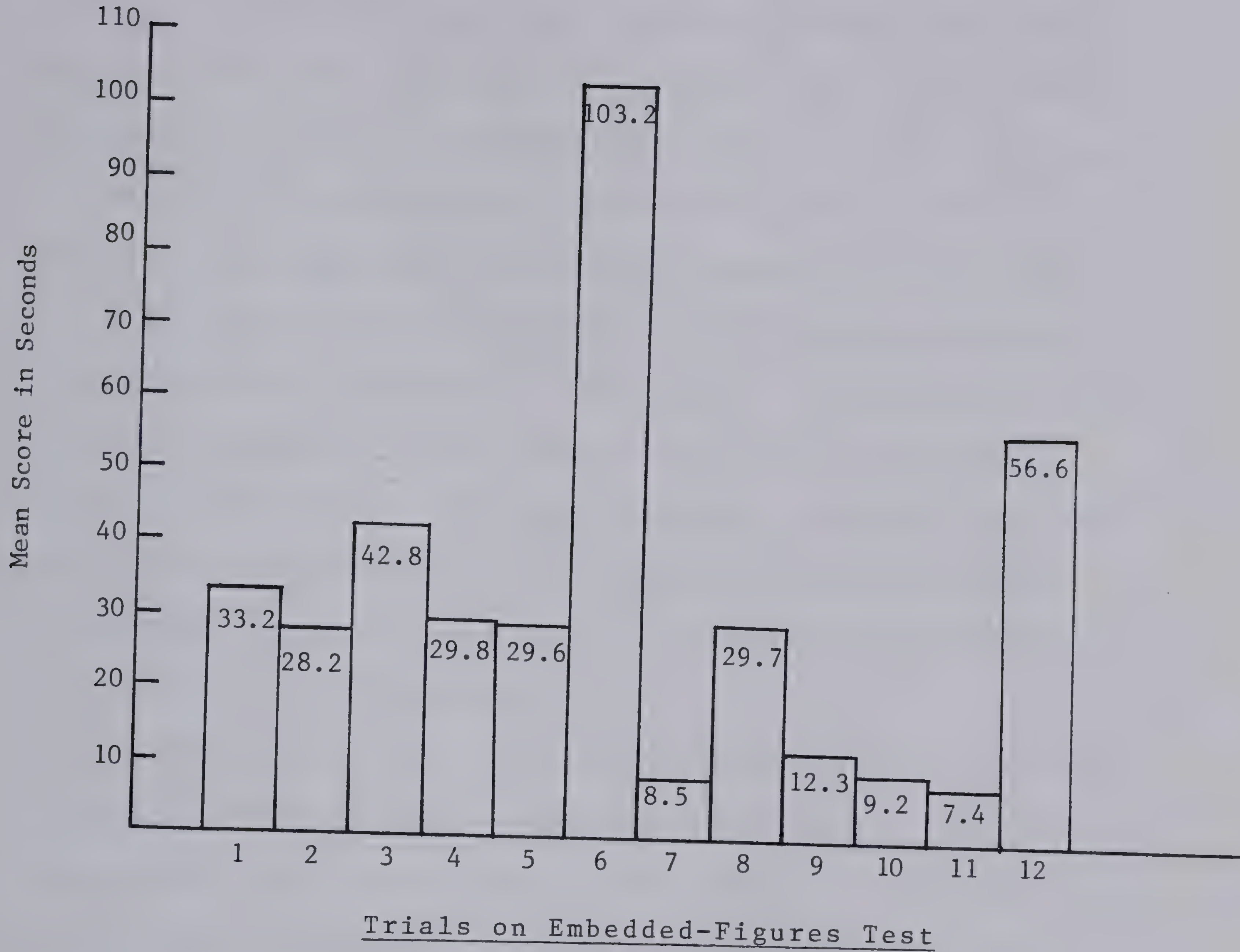

Figure 5. Mean score in seconds on each of the 12 trials of the Embedded-Figures Test (n = 54)

were more difficult than others such as numbers 6 and 12 which had mean scores of 103.2 and 56.6 seconds respectively. Conversely some were relatively less complicated and required less time such as numbers 7 and 11 with mean scores of 8.5 and 7.9 seconds respectively. Other measures of variability and central tendency for each of the 12 trials on the Embedded-Figures Test appear in Table VII.

An average of the 12 trials on the Embedded-Figures Test comprised a subjects' final score. Frequency and percentage distributions for these scores in intervals are given in Table VIII. The most frequent range was from 10 - 20 seconds which occurred among 27.8% of the population. Ninety-one percent of the men in the sample fell into the ranges from 10 - 60 seconds.

Table IX gives the measures of variability and central tendency for the scores on the Embedded-Figures Test for the whole population as well as for colour normal and colour blind men individually. The mean score of 38.3 seconds for colour normal men is considerably higher than the mean score of 26.9 seconds for colour blind men. The mean score for the entire population (n = 54) is given in Table IX and compared with another testing situation (n = 51) in Table X. The mean score in the present research was 7.2 seconds lower than that in the study by Witkin et al. (1951) and 7.7 seconds lower than the results of Spotts and Machler (1967) on 138 college males. The mean score of the colour normal group (n = 27), however, compares favourably being

Table VII

Measures of Variability and Central Tendency for Each of the 12 Trials on the Embedded-Figures Test ($n = 54$)

Trial Number	Range of Means in Seconds (0-180)[a]	Median in Seconds	Standard Deviation
1	2-180	26.5	33.2
2	3-180	17.5	31.6
3	3-180	22.5	49.4
4	3-180	19.5	37.9
5	2-163	12.0	39.3
6	10-180	95.5	66.4
7	2-51	5.5	9.0
8	2-151	17.5	29.0
9	1-81	7.0	15.2
10	3-48	7.2	7.9
11	1-36	5.5	6.8
12	6-180	39.5	44.7

[a] Possible range in seconds

Table VIII

Frequency and Percentage Distributions, and Meausres of Central Tendency on Scores on the Embedded-Figures Test (n = 54)

Score Interval in Seconds	Frequency	Percent
0-10	2	3.6
10-20	15	27.7
20-30	11	20.4
30-40	11	20.4
40-50	5	9.5
50-60	7	13.0
60-70	1	1.8
70-80	0	0
80-90	1	1.8
90-100	0	0
100-110	1	1.8
total	54	100.

Note: Score = average score on 12 trials

Mean score was 32.6, median 27.6, standard deviation 19.2

Table IX

Measures of Variability and Central Tendency for Scores on the Embedded-Figures Test for the Entire Population, Colour Normal and Colour Blind Men

Population	n	Range of Scores in Seconds (0-180)[a]	Mean in Seconds	Standard Deviation
Whole Population	54	6.3-100.8	32.6	19.2
Colour Normal	27	13.4-100.8	38.3	20.3
Colour Blind	27	6.3- 56.8	26.9	16.4

Note: [a] Possible range of scores

Score = average on 12 trials

Table X

Comparisons of Means on the Embedded-Figures Test for Men

Group	n	Mean
Witkin; Lewis; Hertzman; Machover; Meissner ; Wapner (1951)	51	39.8
Spotts & Machler (1967)	138	40.3
Blackwell (1979)		
Whole Population	54	32.6
Colour Normal	27	38.3
Colour Blind	27	26.9

only 1.5 seconds lower than the Witkin et al. (1951) study and 2.0 seconds lower than the Spotts and Machover (1967) study.

Statistical Analysis of the Data

Pearson Product Moment Correlation

A correlation is used to examine the strength of a linear relationship between two variables of interval data. The association "is expressed mathematically as a correlation coefficient and graphically as a scatter diagram" (Compton & Hall, p. 354). The correlation coefficient is a number, the magnitude of which indicates the relative closeness of the measurements to a perfect relationship (-1.0 to + 1.0).

> A positive relationship means that as the measures for one of the variables increase the measures for the other variable also increase. Likewise, as one decreases the other decreases. A negative (or inverse) relationship means that as the measures for one variable increase the measures for the other variable decrease. (Compton & Hall, p. 354)

By using statistical tables the significance of the correlation coefficient is determined.

The Pearson Product Moment Correlation was used to measure the degree of association between perceptual disembedding ability (represented by the score on the Embedded-Figures Test) and fabric preferences. The correlation coefficients and levels of significance for these variables

are given in Table XI. No significant correlations were found among the variables. It is interesting to note, however, that of the relationships that existed, four (pattern, large design, small design, and tint fabric) were inverse relationships.

Correlation was also used to examine the strength of the relationship between age and perceptual disembedding ability. In this case, an absolute age rather than an age interval was used. The correlation coefficient and level of significance are shown in Table XII. No significant correlation was found between the variables. The small association which did exist was an inverse relationship.

<u>Analysis of Variance</u>

Use of an analysis of variance statistical test makes three assumptions,those being the normality of the sample, the homogeneity of variance, and the continuity and equal interval of measures (Kerlinger, 1964, pp. 287-288). These assumptions are met by selecting the sample using a random sampling method. Kerlinger (]964), however, believes that it is not always necessary to use a completely random sample in order to employ the analysis of variance statistical test.

> The evidence to date is that the importance of normality and homogeneity is overrated... Unless there is good evidence to believe that populations are rather seriously non-normal and that variances are heterogeneous, it is usually unwise to use a non-parametric statistical test in place of a parametric one. The

Table XI

Correlation Coefficients (r) and Probabilities (p) for Association Between Perceptual Disembedding Ability and Fabric Preferences (n = 54)

Fabric Preferences	Score on Embedded-Figures Test
Pattern	r = -0.10
	p = 0.24
Plain	r = +0.10
	p = 0.23
Large Design	r = -0.03
	p = 0.42
Small Design	r = -0.05
	p = 0.37
Tint	r = -0.08
	p = 0.28
Shade	r = +0.11
	p = 0.22
Textured	r = +0.04
	p = 0.39
Smooth	r = +0.01
	p = 0.48

Note: Level of significance = 0.05

Table XII

Correlation Coefficient (r) and Probability (p) for Association Between Age and Perceptual Disembedding Ability (n = 54)

Variable	Score on Embedded-Figures Test
Age	r = 0.03 p = 0.42

Note: Level of significance = 0.05

> reason for this is that parametric tests are almost always more powerful than non-parametric tests. (Kerlinger, p. 287)

Lindquist (1953) found that the F distribution is relatively unaffected by the form of the distribution of criterion measures in the parent population.

The third assumption in the use of parametric analysis of variance is that the measures used are continuous with equal intervals. According to the statistical consultant for this research, Mr. C. Humphrey, when cardinal or real numbers (from + to - and including fractions), or scales that use cardinal numbers with decimal places are used, then parametric as opposed to non-parametric statistics are employed. The same applies if there is reference to means rather than to medians or modes.

Because it was found that the effect of non-normality and non-homogeneity (with the exceptions of either very large or apparent differences in the groups) upon the F test was negligible (Lindquist, 1953), and because the data from the sample referred to means, then it was decided to use parametric rather than non-parametric analysis of variance in the present study.

Analysis of variance (F test), together with the t test and chi square, is used to determine whether two samples differ in respect to some property. The t test is limited to two groups whereas the more versatile F test can analyse

differences among several groups simultaneously. An F ratio results from the test which involves " partition of the total variance (total sum of squares) into two parts: variation within the samples (or groups) and variation existing between the samples (or groups)" (Tai,p. 298). The F ratio is compared to statistical tables to determine significance. A significant difference is obvious by the magnitude of the F ratio.

> When samples are actually selected from the same population the F ratio is approximately 1. When the F ratio is significantly larger than 1 it leads to the conclusion that these samples do not come from the same population. (Tai, p. 298)

Analysis of variance was used to compare the mean of the independent variable of age to the means of the dependent variable of fabric preferences. Statistics for the analysis, including the sums of squares, degrees of freedom, mean squares, F ratios, and significance levels are stated in Table XIII. The relationship between age and a preference for tints was significant at the 0.05 level with an F ratio of 2.17. No other significant differences were found.

Results of the analyses of variance between the independent variable of inherent colour vision (either colour normal or colour blind) and the dependent variable of fabric preferences are shown in Table XIV. Statistics given are the sums of squares, degrees of freedom, mean squares, F ratios, and significance levels. No significant differences

Table XIII

Analyses of Variance Comparing Age and Fabric Preferences

(n = 54)

Fabric Preferences	Age				
	Sum of Squares	d.f.	Mean Squares	F Ratio	Significance
Pattern					
Between	166.02	7	23.72	0.90	0.51
Within	1206.35	46	26.23		
Plain					
Between	269.70	7	38.53	0.81	0.58
Within	2176.45	46	47.31		
Large Design					
Between	84.47	7	12.07	0.34	0.93
Within	1642.86	46	35.71		
Small Design					
Between	178.77	7	25.54	0.64	0.72
Within	1847.18	46	40.16		
Tint					
Between	611.05	7	87.29	2.17	0.05 *
Within	1849.71	46	40.21		
Textured					
Between	345.61	7	49.37	1.21	0.31
Within	1871.43	46	40.68		
Smooth					
Between	327.29	7	46.76	1.34	0.25
Within	1603.55	46	34.86		

* $p \leq 0.05$

Table XIV

Analyses of Variance Comparing Inherent Colour Vision and Fabric Preferences (n = 27)

Fabric Preferences	Inherent Colour Vision				
	Sum of Squares	d.f.	Mean Squares	F Ratio	Significance
Pattern					
Between	21.41	1	21.41	0.82	0.37
Within	1350.96	52	25.98		
Plain					
Between	18.96	1	18.96	0.41	0.53
Within	2427.19	52	46.68		
Large Design					
Between	2.67	1	2.67	0.08	0.78
Within	1724.67	52	33.17		
Small Design					
Between	1.19	1	1.19	0.03	0.86
Within	2024.74	52	38.94		
Tint					
Between	4.17	1	4.17	0.09	0.77
Within	2456.59	52	47.24		
Shade					
Between	6.69	1	6.69	0.12	0.73
Within	2930.96	52	56.37		
Textured					
Between	85.63	1	85.63	2.09	0.15
Within	2131.41	52	40.10		
Smooth					
Between	88.17	1	88.17	2.49	0.12
Within	1842.67	52	35.44		

Note: Level of Significance = 0.05

were found among the groups. Inherent colour vision and perceptual disembedding ability (score on the Embedded-Figures Test) were statistically analysed to test the differences of their means using analysis of variance, the results of which appear in Table XV. The relationship was significant at the 0.05 level with an F ratio of 5.14 indicating that colour normal men and colour blind men are significantly different in their perceptual disembedding abilities (from the sample specific).

Acceptance and/or Rejection of the Null Hypotheses

Null Hypotheses 1

There will be no significant correlations between perceptual disembedding ability and a preference for:

a. patterned fabric

b. plain fabric

c. large design on fabric

d. small design on fabric

e. tint fabric

f. shade fabric

g. textured fabric

h. smooth fabric

Based on the Pearson Product Moment Correlation test no significant differences were found between perceptual disembedding ability and any of the fabric preference variables. The null hypotheses 1a to 1h, therefore, failed to be rejected.

Table XV

Analyses of Variance Comparing Inherent Colour Vision and Perceptual Disembedding Ability (n = 27)

Inherent Colour Vision	Perceptual Disembedding Ability				
	Sum of Squares	d.f.	Mean Squares	F Ratio	Significance
Between Groups	1753.90	1	1753.90	5.14	0.03 *
Within Groups	17745.42	52	341.26		
Total	19499.32	53			

* $p \leq 0.05$

Null Hypothesis 2

There will be no significant correlation between age and perceptual disembedding ability.

The correlation coefficient was not found to be statistically significant and consequently the null hypothesis failed to be rejected.

Null Hypotheses 3

There will be no significant differences among the various age groups on a preference for:

a. patterned fabric

b. plain fabric

c. large design on fabric

d. small design on fabric

e. tint fabric

f. shade fabric

g. textured fabric

h. smooth fabric

Analysis of variance computed only one difference among age groups on a preference for tints which was significant at the 0.05 level. Null hypotheses 3a to 3d and 3f to 3h failed to be rejected while null hypothesis 3e was rejected.

Null Hypotheses 4

There will be no significant differences between colour normal men and colour blind men in their preferences for:

a. patterned fabric

b. plain fabric

c. large design on fabric

d. small design on fabric

e. tint fabric

f. shade fabric

g. textured fabric

h. smooth fabric

An analysis of variance revealed that no statistically significant differences existed and, therefore, the null hypotheses 4a to 4h failed to be rejected.

Null Hypothesis 5

There will be no significant difference between colour normal men and colour blind men in their perceptual disembedding ability.

A significant difference ($p = o.03$) resulted from the analysis of variance statistical test, therefore, the null hypothesis was rejected. The colour blind men in the sample were significantly different in perceptual disembedding ability than the colour normal men in the sample. Colour blind men were more Field Independent than the colour normal men.

CHAPTER V

INTERPRETATIONS

The interpretation of the findings will be discussed in relation to the objectives delineated for the study, the hypotheses formulated to test the theories, and the theoretical framework upon which it was based.

The first primary objective was to develop, pretest, and establish validity and reliability on an instrument designed to measure the fabric preferences of men. The result of this was a 64-item test called the Measure of Fabric Preferences which compared the four major classes of fabric; patterned and plain; large and small design: tint and shade; and textured and smooth. The colour was controlled to avoid choices by hue only. A pre-test established content validity and significant split-half reliabilities. Subsequent testing also resulted in quite high correlation coefficients and significant reliabilities (except for small designs and tints). Results of the test indicated that men in general have quite conservative fabric tastes preferring plain, small design, shade, and smooth fabrics more frequently than their counterparts of pattern, large design, tint, and textured fabrics. The first objective, therefore, was accomplished.

Although the Measure of Fabric Preferences was designed to examine four distinct paired variables, it was apparent from the comments made by the subjects that there were also underlying factors being taken into consideration. The most common of these were; whether it required ironing,

whether it washed easily and would not shrink, stretch out of shape, fade, or have the colours run, whether it collected lint, whether it was irritating to the skin, or whether it contained natural or synthetic fibers (many men expressed a distinct dislike for man-made fibers). Even though men were fairly consistent in their choices, as evidenced in the reliability figures, it appears that additional peripheral factors influenced their decisions as well as the main variables.

One man stated that because of his ethnic background (Dutch) he thought patterned materials were inappropriate for pants but acceptable for shirts. For any fabric on the test that he deemed suitable for slacks he chose a solid colour indicating that cultural upbringing may play a role in fabric preferences. Another subject suggested that his occupation (working with the public) caused him to prefer more subdued fabrics for his clothing. Occupation, therefore, may also be an influential force behind fabric selection.

The second of the primary objectives was to investigate the relationship between age and fabric preferences. Hypotheses 3a to 3h were developed to achieve this objective. From the sample specific there was a relationship between age and a preference for tints which approached significance indicating that older men preferred lighter colours. A preference for tints among older men may have resulted because the use of pastel colours was the norm for

many years and it is only recently that bright colours have been introduced but perhaps have never been accepted by the older male population. A problem within the present study was the lack of sufficient representation from all of the age categories. Some groups had a frequency of 2 while another had a frequency of 24. More accurate relationships may have resulted had the numbers been increased and been equal for each age interval. Also, the oldest subject was only 52 years of age, and therefore, a geriatric population which may exhibit some colour acuity losses and prefer more of the shades, was not represented. Other fabric variables were equally chosen by men in various age groups and therefore the null hypotheses that no relationships existed was accepted.

The third primary objective was to assess and compare the fabric preferences of colour normal and colour blind men. Hypotheses 4a to 4h were formulated to test this objective. Kalmus (1960) estimated that there are 11.2% of Canadian men who are congenitally red-green colour blind. This could not be substantiated because a random sample of a large number of men was not possible. It was postulated by (Dr. J.) Lampard, an Edmonton optometrist, however, that at least 10% (and probably more) of the men she tests are colour blind. The number of colour defective men from the University of Alberta in the Summer who volunteered to take part in the research seems to verify those figures.

No statistically significant differences were found between the fabric preferences of colour normal and colour

blind men. Comments made by some of the colour blind men pointed out various differences in fabric choices. Blue and yellow were cited as favourite colours probably because they were the only really intense colours that they were able to experience. Blue is a common preference among men but yellow in particular is not a colour that most colour normal men rank very high in preference (Dorcus, 1926). Colour blind men were also more acute in the detection of small shade variations between the two fabrics on one card on the Measure of Fabric Preferences that were intended to be the same colour. Colour blind men tended to choose one or the other for its relative lightness or darkness whereas colour normal men did not seem to notice a difference. This was especially true of the napped fabrics where more light was reflected from the surface.

The colour defective men in the sample disproved Judd's (1963) theory that they are handicapped in the modern world, at least in the realm of fabric selection. The colour vocabulary of the colour blind men was astonishingly accurate. They assigned descriptive phrases to certain hues such as "warm rosy pink," "deep rich burgundy," "rusty red," "dark moss green," and "vivid lime green," which were not within their capabilities to perceive as normal persons see them yet they described the colours of the fabric in question perfectly. Social mores seem to have more of an influence upon fabric selection than the mere satisfaction of personal aesthetics. Men learn by enculturation that it

is unacceptable for them to wear pinks, "gaudy" colours, flowers, or soft textures because these are associated with female attire. Instead, in keeping with the expected sex roles in our society, men tend to relate sombre colours, plain material, insignificant prints and smooth fabrics to masculinity. Inherent colour vision does not affect this learned behaviour and colour blind men do not deviate from these accepted norms. They do, however, exhibit some compensatory techniques in the selection of clothing. Many relied on someone else such as a wife, sister or friend to shop for them or they sought the advice of a salesclerk when purchasing garments. In summary, colour blind men in the sample had learned to cope extremely well and were not different or at a disadvantage in the area of fabric preferences. The inclusion of an elderly population with acquired colour vision defects may reveal less of the learned social factors and more compensatory characteristics in fabric preferences.

The fourth objective was to investigate the relationship between perceptual disembedding ability and fabric preferences. Hypotheses 1a to 1h reflected this intent. No significant correlations were found and it was concluded from the sample specific that one's mode of perceptual disembedding is independent of fabric choices. Socialization factors as opposed to inherent characteristics seem to be responsible for particular fabric preferences. Witkin's (1947) theory that there exists two types of perception, that is, relatively Field Dependent or relatively Field Independent was

supported.

Two objectives that were interesting by-products of the research but were not directly related to it were formulated to provide additional information. Objective number five was the first of these secondary investigations which sought to examine the relationship between age and perceptual disembedding ability. Null hypothesis 2 was accepted in this case, indicating that no significant correlation existed. Perceptual disembedding is an enduring and stable characteristic over one's lifetime and, in the present study, did not alter significantly with age. The small number of men within some of the age intervals may have distorted the statistics. A larger sample of equally represented age groups could have yielded more accurate results. Also, a geriatric population may have demonstrated differing scores but they were not represented in the sample.

The final secondary objective was to investigate the relationship between inherent colour vision and perceptual disembedding ability. Hypothesis 5 was devised to test the theory. The null hypothesis was rejected because a significant difference was found to exist between the mean scores of colour normal men and colour blind men on the Embedded-Figures Test. The theory of Pickford (1965) that colour blind men tend to break up the background more readily than colour normal men was supported. This is perhaps a manifestation of a compensatory function of colour blind men that when one aspect of vision (colour) is impaired

another facet (perceptual disembedding) is developed to a greater extent. Colour was superimposed on to the designs in the Embedded-Figures Test to render them more confusing. Colour blind men were not distracted by the colours and tended to be more self reliant when separating the simple figure from its context. To verify that colour blind men are in fact more Field Independent and it was not just an advantage they possessed in the coloured Embedded-Figures Test, they should undergo an additional measure of Field Dependence such as the rod-and-frame test.

The findings of this study partially supported the theoretical framework which involved the expected frequencies of colour blind men, the existence of two types of perception, that is, those who are reliant upon the background and those who are self reliant, and the fact that colour blind men tend to be more Field Independent than colour normal men. It does not, however, support the theory that colour blind men from the sample (who were between the ages of 18 and 52) are handicapped in our society specifically in the area of fabric selection.

CHAPTER VI

SUMMARY AND RECOMMENDATIONS

Summary

The purpose of the research was to determine men's fabric preferences and to investigate three innate characteristics which might influence them. Decisions such as fabric choices might be pre-determined by characteristics inherently possessed by an individual such as age, colour vision ability, or mode of perception. It was thought that: age groups tend to distinguish themselves by the clothing that they wear, people who are colour defective might compensate for this lack by increased tactile or visual elements in clothing, and because people in general are polarized in the area of Field Dependence this might result in some division in fabric selection as well.

The theoretical framework was based on: statistics by Kalmus (1960) that 11.2% of Canadian men are colour blind, the theory of Judd (1963) that colour blind men are handicapped in the modern world, the postulations of Combs (1959) that the perceptions of those with physical handicaps deviate from normal, Witkin's (1947) theory of Field Dependence-Independence, and the works of Birren (1961) and Pickford (1965) concerning the perceptual disembedding abilities of colour blind men, the former viewing the defect as debilitating and the latter adopting the view that it is facilitating.

A non-random sample of 27 colour normal and 27 colour

blind men were purposively selected. The instruments administered were: Background Information, Ishihara Pseudoisochromatic Plates, Measure of Fabric Preferences, and Witkin's Embedded-Figures Test (Short Form). All testing was completed during the Summer of 1979.

The Pearson Product Moment Correlation and Spearman-Brown formula were used to establish split-half reliability on the Measure of Fabric Preferences. Pearson Product Moment Correlations and analyses of variance were used to statistically analyse the data.

Results of the study established validity and reliability on the Measure of Fabric Preferences. The rank order of men's fabric preferences from least to most preferred were: pattern, large design, tint, textured, small design, shade, smooth, and plain. No significant relationships were found among age and seven of the fabric variables, however, the relationship between age and a preference for tints was significant at the 0.05 level. No statistically significant relationships were established between colour vision ability and fabric preferences indicating that colour blindness does not predispose men to make fabric choices which are different from those with normal colour vision. No significant correlations were found between perceptual disembedding ability and fabric preferences. Even though men are either relatively Field Dependent or Field Independent these differences do not affect selections in fabrics for clothing. No significant relationships were established

between age and perceptual disembedding ability implying that Field Dependence is a constant individual trait enduring over many years.

A significant difference was found between the perceptual disembedding abilities of colour normal and colour blind men ($p = 0.03$). Colour blind men in the sample were more Field Independent than colour normal men.

The objectives outlined for the study were accomplished. The theoretical framework was only partially supported because colour blind men were not found to be handicapped, at least in the area of fabric selection. From the results of the research it seems that social and other factors, as opposed to inherent characteristics, had the greatest bearing on fabric preferences among men in the sample.

Recommendations

On the basis of this study the following recommendations have been formulated:

1. The rank order of men's fabric preferences should be considered by manufacturers of men's textiles to ensure maximum satisfaction for their customers by producing fabrics that are most highly desired among men.
2. Avenues to explore which may have some bearing on men's fabric preferences are ethnic background, occupation, and other social factors. A theoretical framework must be devised to incorporate these elements.
3. It is suggested that some fabrics on the Measure of Fabric Preferences be substituted with more tradi-

tionally "masculine" textures and designs. It is important to control colour on the test to avoid choices by hue only but the colours utilized do not have to be the primary colours. Colours most frequently chosen by men such as navy blue, dark green, brown, or grey could be used.

4. For greater research control, a more specialized Measure of Fabric Preferences which was equally devoted to shirt and trouser fabrics only could be developed.
5. Subsequent studies in the area of clothing and textiles involving men would be advised to include colour blind men in the sample because they represent a large minority (11.2%) within the normal North American male population.
6. To strengthen the research design and permit the use of inferential statistics, the sample should be selected in a random fashion.
7. Use of a larger sample would be helpful in obtaining more accurate results and would allow for the determination of the frequency of colour blindness among the local male population.
8. More accurate assessments of the effects of age might result if the sample included an equal number of men in each of the age groups. The addition of senior citizens would offer more diversity to the study and could provide some information on the effects of acquired colour vision defects.

9. A second measure of Field Dependence to be used in conjunction with the Embedded-Figures Test would help to corroborate the results and overcome the possibility that colour blind men are more Field Independent only on a test which incorporates colour.

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APPENDICES

APPENDIX A

Background Information

BACKGROUND INFORMATION

1. Age ____________

2. According to recent literature, approximately 10% of Canadian men have colour defective vision. To your knowledge, have you ever had an eye examination which measured your colour vision?

   ____________ ____________ (Check one)
   yes no

3. To your knowledge, do you have a colour vision defect?

   ____________ ____________ (Check one)
   yes no

APPENDIX B

Ishihara Test Record Sheet

ISHIHARA TEST

Number of Plate	Normal Person	Person with Red-Green Deficiencies	Person With Total Colour Blindness And Weaknesses	Subject
1.	12	12	12	
2.	8	3	*	
3.	6	5	*	
4.	29	70	*	
5.	57	35	*	
6.	5	2	*	
7.	3	5	*	
8.	15	17	*	
9.	74	21	*	
10.	2	*	*	
11.	6	*	*	
12.	97	*	*	
13.	45	*	*	
14.	5	*	*	
15.	7	*	*	
16.	16	*	*	
17.	73	*	*	
18.	*	5	*	
19.	*	2	*	
20.	*	45	*	
21.	*	73	*	

NORMAL ______________ COLOUR DEFECTIVE ______________

APPENDIX C

Information Given to Subjects

1. INFORMATION SHEET

Fill out the information sheet accurately and completely. Please do not omit any questions.

2. ISHIHARA PSEUDOISOCHROMATIC PLATES

These plates assess your relative ability to see certain colours and are called the Ishihara Plates. You will be shown 21 plates in which you will either see a number or you will see nothing. If you see a number you simply state the number that you see or if you do not see anything in the plate then you state that fact. The first plate is representative of the entire test. State what you see in the first plate.

3. MEASURE OF FABRIC PREFERENCES

The following is a measure of your preferences for certain fabrics. There are 32 cards each containing two pieces of material. You must choose one of the fabrics on each card that you prefer for your personal clothing. Your preferences can be based on touch as well as sight. After you have chosen either "A" or "B" as the one you like the best you must decide on the degree of your preference and circle the word or phrase which best describes your choice. Select only one fabric from each card and give an answer for every card.

4. EMBEDDED-FIGURES TEST

This is an index of perception. Everyone has a different way of looking at things and this is a measure to assess those differences. I am going to show you a series

of coloured designs. Each time I show you one, I want you to describe it in any way you wish. I will then show you a Simple Form which is contained in that larger design. You will then be given the larger design again, and your job will be to locate the Simple Form in it. Let us go through a practice trial to show you how it is done.

I will now show you the coloured design again and you are to find the Simple Form in it. As soon as you have found the Simple Form let me know, and start tracing the Simple Form with this stylus. When you are tracing, do not let the stylus touch the surface of the card.

This is how we will proceed on all trials. In every case the Simple Form will be present in the larger design. It will always be in the upright position, so don't turn the card around. There may be several of the Simple Forms in the same design, but you are to find and trace only one. Work as quickly as you possibly can, since I will be timing you, but be sure that the form you find is exactly the same as the original Simple Form in shape, size, and proportions. As soon as you have found the form, tell me at once and then start to trace it. If you ever forget what the Simple Form looks like, you may ask to see it again, and you may do so as often as you like. Are there any questions? (Witkin, Oltman, Raskin, & Karp, 1971, p. 16)

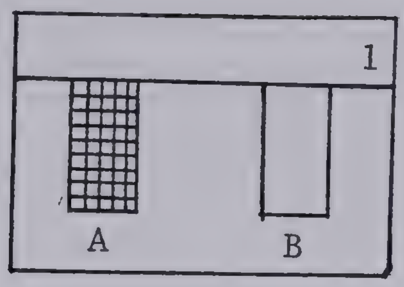
APPENDIX D

Measure of Fabric Preferences

MEASURE OF FABRIC PREFERENCES

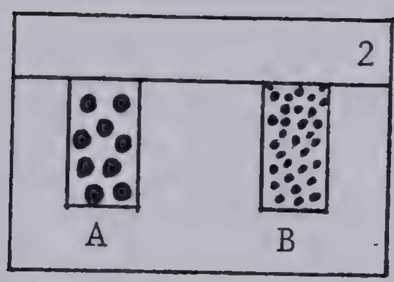
Variable 1

Pattern-Plain



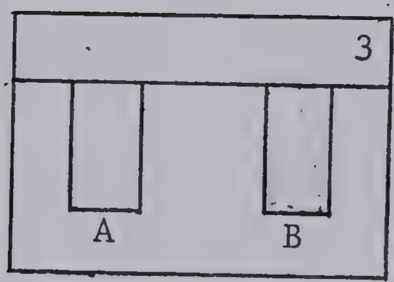
Variable 2

Large design-small design



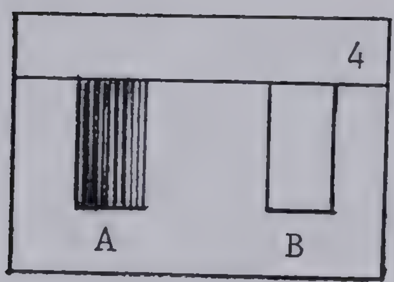
Variable 3

Tint-shade



Variable 4

Textured-smooth



APPENDIX E

Score Sheet for Measure of Fabric Preferences

MEASURE OF FABRIC PREFERENCES

Circle the number which corresponds to the most appropriate description of your preference.

Very Slight	Slight	Moderate	Strong	Very Strong
1	2	3	4	5

A						B					
1.	1	2	3	4	5	1.	1	2	3	4	5
2.	1	2	3	4	5	2.	1	2	3	4	5
3.	1	2	3	4	5	3.	1	2	3	4	5
4.	1	2	3	4	5	4.	1	2	3	4	5
5.	1	2	3	4	5	5.	1	2	3	4	5
6.	1	2	3	4	5	6.	1	2	3	4	5
7.	1	2	3	4	5	7.	1	2	3	4	5
8.	1	2	3	4	5	8.	1	2	3	4	5
9.	1	2	3	4	5	9.	1	2	3	4	5
10.	1	2	3	4	5	10.	1	2	3	4	5
11.	1	2	3	4	5	11.	1	2	3	4	5
12.	1	2	3	4	5	12.	1	2	3	4	5
13.	1	2	3	4	5	13.	1	2	3	4	5
14.	1	2	3	4	5	14.	1	2	3	4	5
15.	1	2	3	4	5	15.	1	2	3	4	5
16.	1	2	3	4	5	16.	1	2	3	4	5

continued ...

Very Slight	Slight	Moderate	Strong	Very Strong
1	2	3	4	5

A						B					
17.	1	2	3	4	5	17.	1	2	3	4	5
18.	1	2	3	4	5	18.	1	2	3	4	5
19.	1	2	3	4	5	19.	1	2	3	4	5
20.	1	2	3	4	5	20.	1	2	3	4	5
21.	1	2	3	4	5	21.	1	2	3	4	5
22.	1	2	3	4	5	22.	1	2	3	4	5
23.	1	2	3	4	5	23.	1	2	3	4	5
24.	1	2	3	4	5	24.	1	2	3	4	5
25.	1	2	3	4	5	25.	1	2	3	4	5
26.	1	2	3	4	5	26.	1	2	3	4	5
27.	1	2	3	4	5	27.	1	2	3	4	5
28.	1	2	3	4	5	28.	1	2	3	4	5
29.	1	2	3	4	5	29.	1	2	3	4	5
30.	1	2	3	4	5	30.	1	2	3	4	5
31.	1	2	3	4	5	31.	1	2	3	4	5
32.	1	2	3	4	5	32.	1	2	3	4	5